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A COMPARATIVE ANALYSIS OF THE PERFORMANCE INTERVIEW IN GRADUATE INSTRUCTION

by

Sally Ann Smith Atkins

A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

Greensboro
1972

Approved by

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Dissertation Adviser

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March 17 1972
Date of Examination

ACKNOWLEDGEMENTS

The author wishes to express her appreciation to the members of her doctoral committee, Dr. Harold Mahoney, Dr. Wallace Phillips, Dr. Roger Bourdon, and Dr. Herbert Wells, for their continued guidance and support not only through the preparation of this dissertation but throughout her entire doctoral program. Special appreciation is expressed to Dr. Roger Bourdon for his advice, encouragement, and patient assistance throughout the research.

The author wishes to thank the students who made this research possible, the observers who collected the data, the teaching assistants and professors who cooperated in the study, and the friends who offered understanding and support throughout the preparation of this dissertation.

A special word of appreciation is expressed to Mr. P. J. O. Smith, the author's father, who contributed his knowledge, skill, and many hours of assistance in the preparation of the graphs.

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CHAPTER I

INTRODUCTION AND NEED FOR RESEARCH

Although the goals of education, particularly at the graduate level, involve much more than the processing and storing of information, it is generally accepted that mastery of information is prerequisite to the utilization of that information in creative analysis, synthesis, and generation of ideas. To achieve the goal of student mastery of information various instructional methodologies have been employed.

Traditional approaches to instruction at the graduate level have included the lecture method as well as various group discussion procedures. The limitations of these traditional approaches in producing the desired mastery of information have been pointed out (Malott & Rollofson, 1970). According to Fiebert (1970) the lecture is inefficient in facilitating the desired retention, recall, and transfer of ideas as well as aversive to many students and teachers. According to Hobbs (1970) discussion methods are frequently fraught with confusion concerning their goals, strategies,

roles, and relationship to other types of intellectual discourse. He further emphasizes that it is difficult, if not impossible, to maintain any control over the topographical aspects of the verbal behavior which occurs in group discussions.

Thus it seems that traditional approaches to graduate instruction are limited by a number of factors, including the lack of any means of controlling the amount of information a student is retaining and integrating into his already existing repertoire.

Need for Research

It has been suggested by many (Fiebert, 1970; Fischler, 1970; Ikenberry, 1971; Skinner, 1965) that there is a need to develop and employ alternative instructional systems in which learning criteria are explicit and effectiveness can be evaluated. An alternative teaching methodology which has grown out of the experimental analysis of behavior is contingency management. Contingency management, according to Skinner (1968), refers to the arrangement of the contingencies of reinforcement (the relations which exist between behavior and its consequences) so that more effective control of the behavior is achieved. The three variables of a

contingency of reinforcement are 1) the discriminative stimulus or the occasion upon which the behavior occurs, 2) the response or the behavior, and 3) the reinforcing stimulus or the consequence of the behavior. Contingency management in the classroom involves deciding what the desired learning outcomes are and specifying them in behavioral terms, then systematically reinforcing the desired behaviors when they occur. Specific techniques based on contingency management include a variety of procedures ranging from token economies to programmed instruction (Altman & Linton, 1971; Hanley, 1970).

Various types of contingency management procedures have been implemented at the elementary level, to a lesser extent at the secondary level, and even less in higher education (Altman & Linton, 1971; Hanley, 1970). The literature search failed to reveal any reports of the use of contingency management in graduate education.

Behavior modification by contingency management was first applied to education at the college level by Keller (1968). The successful use of contingency management in conjunction with programmed instruction for teaching courses in introductory psychology, statistics, and experimental

analysis of behavior has been reported (Ferster, 1968; Lloyd & Knutzen, 1969; Myers, 1970; Sheppard & MacDermot, 1970). The use of contingency management in higher education without the aid of a programmed text has also been highly effective in achieving learning outcomes (Malott & Svinicki, 1969; McMichael & Cory, 1969).

The performance interview is a variation of the technique of contingency management used by Ferster (1968) to guarantee that a student has achieved the intended mastery of the text material. It is basically a structured verbal exchange in which a student (interviewee) talks with the instructor or another student who has already successfully completed the interview (interviewer). The essence of the interview is verbal behavior. The importance of verbal behavior in thinking and learning has long been an accepted assumption in education (Skinner, 1957; Whorf, 1956). Although the traditional approaches to instruction emphasize the written word, the use of the spoken word has some immediately apparent advantages. The most obvious advantage is speed. It is possible to cover a great deal more information in 10 minutes of speaking than by writing for 10 minutes. Furthermore, speech serves not only as a response but also

as stimuli which can exert control over new sequences of responses (Staats, 1968). Thus, there seems to be some basis for assuming that an interview procedure could be an efficient means of achieving student mastery of content as well as the fluency needed to express the information acquired.

The relationship between instructional approach and specific classroom behaviors such as attending and responding remains highly speculative. As Packard (1970) points out, classroom attention is a complex of constantly fluctuating S-R relationships, involving a variety of discriminative stimuli and reinforcers. It seems more likely that responding behavior would be affected by an instructional approach which emphasizes student verbalization, but there is no evidence to support such an assumption.

Statement of the Problem

It was the primary purpose of this investigation to compare the performance interview with two other instructional methodologies commonly employed in graduate education with regard to their relative efficiency in producing mastery of subject matter by students. The performance interview was

compared with the lecture method and with a small leaderless group discussion procedure in order to investigate its efficacy as a graduate instructional methodology. A secondary purpose of this study was to investigate the effects of the interview technique upon attending and responding behavior in class.

CHAPTER II

RELATED RESEARCH

Although a great deal of research has been done on instructional method, most of it has yielded very few solid, significant results (Eckert & Neale, 1965; Gage, 1966). In a report of studies on college teaching methods Dubin & Taveggia (1969) presented a very dismal picture. After examining studies of seven million college students in various universities evaluating different methods of instruction, the authors concluded that no particular method emerged as superior in producing improved test performance.

The failure to obtain significant results has been attributed to weakness of research design and methodology as well as to the teaching procedures themselves (Dubin & Taveggia, 1969; Eckert & Neale, 1965), leaving open much room for debate among advocates of different methods. Gruber (1965) has expressed the general feeling of those whose faith in student-centered approaches has not been shaken by the paucity of substantive research results. He pointed out that the failure of researchers to obtain dramatic results with the use of

student-centered approaches should not be considered as validation of the lecture approach. He emphasized that subjecting college students to some 2,000 lectures in four years is not justified by the finding that the lecture is not significantly worse than other methods.

Operant Principles and Instructional Methodology

In recent years there have been increased efforts to apply the principles of operant conditioning to instructional methodology. This trend has brought more significant results than have been obtained in the past with other methodologies. These efforts have manifested themselves most often in education through the use of programmed instruction and teaching machines (Martin, 1970). A number of volumes have been written which are concerned with the role of programmed instruction and teaching machines in learning (Calvin, 1969; Glaser, 1965; Lumsdaine & Glaser, 1960), but application of operant principles to the college classroom has been limited, and when it has been done has often consisted only of the use of programmed texts (Martin, 1970). Martin has suggested the following reasons for the rather limited application of

operant principles:

1. Lack of time and effort or perhaps capital for materials (which are not really necessary).
2. Lack of knowledge of operant research on the part of educators. It seems that few professors in disciplines other than psychology are familiar enough with this body of knowledge to be able to apply it.
3. A tradition in education which opposes "manipulation" of the individual and sees it as antithetical to developing "responsible, thinking citizens." This issue is appropriately considered elsewhere by Skinner (1966).

Programmed Instruction in Higher Education

Most studies concerned with programmed instruction in education have compared some form of programming, usually the use of a programmed text, with more conventional means of instruction. Rawls, Perry, & Timmons (1966) compared conventional instruction and individual programmed instruction in the college classroom. The conventional instruction consisted of a commercially prepared programmed text. The material covered was the physiological section of an introductory psychology

course. The authors used 21 matched pairs of subjects to compare the two methodologies. They found no significant difference upon criterion tests at the completion of the unit, but they reported that six weeks later the programmed instruction group performed significantly higher upon a retest.

McGrew, Marcia, & Wright (1966) compared three instructional conditions, televised lecture, a mimeographed text, and a "branching program" (i.e. when the subject gives a correct answer, he skips subsequent repetitive frames). Their subjects were 66 undergraduate psychology majors in a tests and measurements course. The subjects were administered a pretest and two criterion tests, each consisting of 25 objective items. An analysis of covariance was used to compare test results, and the programming approach was not shown to be superior. The experimenters concluded that the results were due to the elimination of repetition in the program. They concluded that it was sheer repetition of material, regardless of the medium employed that was significant in producing the desired learning outcomes.

Williams (1967) reported on the application of operant techniques to the undergraduate electrical engineering

curriculum at Carnegie Institute of Technology. Although his report made a contribution to the literature, this program was limited to the use of teaching machines in particular content areas. It did not deal with a general application of operant principles to the college classroom.

Gilbert (1969) reported on the role of programmed instruction in the university instructional services at Northeastern University. Here, too, the use of operant principles was limited to presentations of course content by teaching machines and programmed texts. Gilbert spoke highly of programmed instruction as a learning method which could relieve teachers from some of the tedious spoon-feeding which would preclude a creative approach to teaching.

Several researchers have investigated the effectiveness of programmed instruction in relation to other variables. It was suggested by Ryan (1965) that the important variable in producing increased performance on criterion measures was the students' choice of method rather than the methodologies themselves. She compared performance on criterion measures of students who selected one of three instructional approaches (student-directed group participation, student-directed independent study, and teacher-directed independent study) with

that of students who had no choice and received a combination of the three approaches. She found no significant difference in performance among students in the three approaches, but a highly significant difference between choice and no choice factors. Those students who had been given a choice scored higher. Flynn (1966) compared the effects of programmed instruction and regular classroom procedures for "achievers" and "underachievers." He reported that for underachievers the method had no observable effect, but that for the achiever the operant techniques were superior.

Further Application of Operant Principles in College

Although the principles of behavior analysis do not appear to have been as widely applied in higher education as is conceivably possible, very recently some authors have reported investigation in this direction under the rubric of "contingency management." Although strictly speaking they are not contingency management, several preliminary studies explored the possibilities for utilization of principles of operant conditioning in a variety of ways other than simply using a programmed text. Baer (1966) discussed a course in child development, which he taught from the experimental

analysis of behavior point of view. The course itself was not programmed. An attempt was made to make the students experienced observers, able to discuss topographies of behavior in terms of antecedents and consequences and able to design experiments involving the manipulation of the controlling variables of a child's behavior. On the basis of his experience, he advocated the method as a viable approach to such a course.

Webb & Baird (1967) reported on a form of student centered teaching called Continuous Progress, which involved behavioral objectives, instructions for fulfilling objectives, lists of readings and written assignments, study guide questions, no formal class meetings, moving at one's own rate, and individual conferences. In comparing the experimental group to a control group taught in the conventional lecture-discussion method, scores on the objective examination were significantly higher on the posttest for students in the experimental group. Students with the lowest grade point averages appeared to benefit more than did those with high grade point averages.

Chahbazi (1967) compared the performance of students in two sections of general psychology taught by the traditional

lecture method with that of two experimental groups taught by the same teacher. The experimental groups were divided into small groups and encouraged to clarify, develop, and elaborate on primary concepts in the text. The instructor went from group to group to serve as a "reinforcer." A significant increase in test scores was shown by the two experimental sections.

Pitts & Powers (1971) have reported on the use of "incentives" in an undergraduate educational psychology course. A criterion (B level performance) was established, and those not meeting it were automatically channeled into remedial work. Students could choose to work for various "incentives" such as field trips and privileges. The investigators found that there was a significant difference between performance under incentive conditions and performance under nonincentive conditions. In addition, choosing an incentive to work for was positively related to the use of learning aids, to the number of questions asked in class, and the positive rating of the course in comparison with others.

Contingency Management in Higher Education

Although limited in scope, such preliminary studies represented efforts to at least apply operant principles to

education. The first study which can genuinely qualify as "contingency management," a comprehensive type of programming, in higher education was done by Keller (1968). His approach, which was enthusiastically received and in which mastery of course material was judged excellent, featured a "go at your own pace" procedure, unit perfection requirement for advancement, lectures and demonstrations as vehicles of motivation rather than sources of information, and frequent testing. Although stress was put on the written work, Keller did employ the interview technique developed by Ferster (1968). Keller viewed the technique as a means of guaranteeing a product of high quality where the goal was fluency with respect to each of the main features of the course.

Ferster (1968) reported the results of an experiment in the application of principles of reinforcement to the creation and maintenance of new verbal behavior in a class in introductory psychology at Georgetown University. The basic feature of the course was his own interview technique, which he described as a formal arrangement in which the listener, one who has already read that part of the text, listens to the speaker without interruptions. Interviews were held on each small section of each chapter in the text.

To control quality, students were required to take brief quizzes at the end of each chapter. Course assistants, upperclass psychology majors who had already been through the course, scheduled interviews, graded and discussed the results of written quizzes, and discussed problems and content with students. The course instructor observed all class procedures, answered questions, and held conferences with students. Of the 91 subjects who enrolled for the course, 10 dropped the course after two weeks, 79 completed the course for credit, 90% with A's, 4% with B's, and 6% with C's. Grades were determined by how much of the course of study was completed.

Two other reports of contingency management in introductory psychology courses were published in the following year. Malott and Svinicki (1969) described an experimental course which featured daily reading assignments, frequent quizzes upon which mastery was required, and a "doomsday contingency" in which a student had to drop the course after making six F's on quizzes. Such procedures did not serve to make the approach very popular among students in the course. It did, however, produce 99% A's. Modifications have continued to be made in the ongoing study of the

application of contingency management to higher education at Western Michigan University.

McMichael and Corey (1969) compared a contingency management approach with a traditional lecture approach to teaching introductory psychology with a standard textbook. Subjects were 880 students enrolled in four psychology classes, one experimental class, and three control classes. An analysis of variance showed the distribution of final exam scores to be significantly higher ($p < .005$) for the experimental group and not significantly different among the control groups. Students in the experimental group also rated the course higher than did those taught by conventional methods. A weakness in this study was the use of different instructors for various groups. Results could have been due to uncontrolled teacher variables which relate to teaching effectiveness rather than the method alone.

Lloyd & Knutzen (1969) used operant principles in an undergraduate course in the experimental analysis of behavior. As in the other contingency management studies, the terminal behaviors were specified and the existing contingencies were spelled out in terms of what activities were required at what deadlines for each grade. Material completed

at one stage was prerequisite for the next, and behaviors were "shaped" by requiring greater and greater amounts of performance as the course progressed. In addition to using operant principles in the classroom, the authors employed an operant analysis of the data, plotting each student's cumulative record. The experimenters felt that early deadlines would have induced students to begin working sooner since the records showed that once students began to work they continued at a high and steady rate. The contingency management procedures used were considered valuable in having students actively participating in the course, in illustrating some of the principles under consideration, and in removing many of the ambiguities associated with traditional procedures of teaching and testing.

Sheppard & MacDermot (1970) again employed the interview technique used by Keller (1968) and Ferster (1968) in their program of contingency management for an introductory course in psychology. Of the 168 subjects who remained in the experimental group, 55 reached the A level of performance, 58 reached the B level, 51 the C level, two the D level, and two students failed the course. When final examination scores were compared with those of the control group,

those of the experimental group were significantly higher on both objective and essay finals. Students in the experimental group also rated the course more positively.

Myers (1970) reported the results of the contingency management approach to the teaching of introductory statistics. Students exhibited a "uniformly high level of performance" and viewed the course very favorably. These results were attributed to the contingencies employed, the most important ones, according to instructor judgment and student ranking, being self-pacing, frequent nonpunitive exams, and a guaranteed A for near perfect performance.

Summary

It was evident from a survey of the literature relating to the application of operant techniques to higher education that the investigation has been limited. The literature search failed to reveal any published studies of contingency management in graduate education.

The studies surveyed support the contention that contingency management approaches employing an interview technique are viable alternatives to traditional teaching approaches. However, a gap exists in the research substantiating their

efficacy. There have been no reports of attempts to demonstrate a functional relationship between the interview technique and individual subject performance.

CHAPTER III

DESIGN AND SCOPE

It was the purpose of this study to investigate the comparative effectiveness of the performance interview, a modified version of Ferster's interview technique, as an instructional approach in graduate education. The performance interview was compared with a small leaderless group discussion approach (Experiment I - Class A) and with a traditional lecture approach (Experiment II - Class B). The effects of these procedures on the specified criteria for mastery of subject matter as well as upon attending and responding in class were observed.

In order to carry out this investigation a single subject ABAB time series design was employed in each experiment. This experimental design (Baer, Wolf, & Tisley, 1968; Bijou, Peterson, Harris, Allen, & Johnston, 1969; Sidman, 1960) is one in which each subject serves as his own control. Data are collected on individual subjects under four or more conditions to evaluate the functional relationship between the behavior observed and the environmental stimuli (treatment).

During the first of these conditions, the baseline period (A), the normal field situation is left unchanged. In the second period, the first experimental period (B), the independent variable is manipulated and its effect upon behavior is observed. During the third period (A) conditions are changed to those which were in effect during the baseline period, and in the fourth period (B) the conditions of the experimental period are reinstated.

In this study the main independent variables were the three teaching methods: lecture, leaderless group discussion, and the performance interview. The dependent variable was student mastery of course content as measured by performance on weekly teacher-constructed examinations. The effects of the performance interview and lecture on attending and responding in class were observed for eight subjects in Experiment II (Class B).

Delimitations

The scope of the study was limited to investigation of the specific variables under consideration. There are a number of relevant questions which the study was not designed to investigate.

No attempt was made to study the effects of the independent variables (the three teaching methods) on any behaviors other than the specific dependent variables mentioned. Although it would be of interest to study possible effects of each method on behaviors such as group cohesiveness or student opinion of the course, such a study was not within the scope of this investigation.

It has already been demonstrated that teaching method effectiveness may vary as a function of student characteristics (Doty, 1967). It seems likely that teaching method effectiveness would also vary as a function of instructor characteristics and method preference. In this study, however, no attempt was made to investigate the relationship between teaching method effectiveness and other variables such as student or instructor characteristics. Five instructors, two professors and three teaching assistants, with different characteristics and method preferences were used.

The performance interview itself consists of a number of separate components (i.e. student verbalization, interviewer reinforcement, programming of content). No analysis was made of the content of interviews or the effect

of any separate components of the interview upon behavior. The validity of the interview as a legitimate teaching method is assumed, based on previous research (Ferster, 1968; Keller, 1968; Sheppard & MacDermot, 1970).

The relationship of classroom attending and responding to mastery of course content has not been demonstrated. It was not the purpose of this study to investigate the validity of the generally held assumption that attending and responding in class are adaptive classroom behaviors and therefore desirable student behaviors.

Questions to Be Answered

The primary question asked in this study was: Is there a difference in student mastery of course content between periods in which the small group discussion or the lecture is the instructional methodology employed and the periods in which the performance interview is the methodology used? Specific hypotheses tested were the following:

1. There is no significant difference in the scores of students on weekly examinations between group discussion (baseline) and performance interview (experimental) conditions.

2. There is no significant difference in the scores of students on weekly examinations between lecture (baseline) and performance interview (experimental) conditions.

The following subsidiary questions were also investigated:

1. Is there a difference in frequency of responding in class between lecture (baseline) and performance interview (experimental) conditions?
2. Is there a difference in percentage of attending behavior in class between lecture and performance interview conditions?
3. Is there a difference in scores of students on weekly examinations between the ABAB sequence and the BABA sequence?
4. Is there a difference in attending and responding in class between students who receive the ABAB sequence and those who receive the BABA sequence?

CHAPTER IV

METHOD

The subjects in this study were 28 graduate students enrolled in two courses at the University of North Carolina at Greensboro during the spring semester of 1971. Experiment I was conducted in Class A, Education 643 - Behavior Modification. Experiment II was conducted in Class B, Education 675 - Theories of Counseling. All students in both classes were used as subjects. Subjects were randomly divided into two separate groups within each class. One group in each class received the series of conditions in reversed order (BABA) to control for sequence effects and variations in difficulty of material and in tests. In Class B eight subjects were randomly selected for observation of attending and responding.

Instruments

Outcome of instruction was measured by teacher constructed weekly examinations. The same examination was administered to all subjects within the same class.

Examinations were blind scored on a 100-point scale by the professor or by a graduate student assistant with the aid of a professor-constructed key. The tests were objective (short answer, fill-in, true-false, and multiple choice), designed to take approximately 20 minutes to complete. Each test was a check on the degree of mastery of the material covered during the instructional period of the session.

Observers

Behavioral observations of eight subjects in Class B were made each session of the experiment through a one-way screen. The observers were undergraduate students, trained in the use of the observational code (See Appendix A). Observations were recorded in 10-second intervals for periods of 10 minutes on the Observer Data Sheet (See Appendix B). The counting off of intervals was tape recorded so that all observers received the count simultaneously while still devoting full attention to observation. Observation periods were distributed throughout the duration of the experiment. Observers were trained to a satisfactory level of reliability (.90 agreement) prior to the beginning of the study. A video tape of classroom behavior was used in training the observers

in the use of the observational code. The coefficient of reliability was computed by dividing total number of agreements on time segments between two observers by the total number of time segments observed. A constant check on observer reliability was maintained throughout the study by having observers work in pairs, alternating partners each week.

The Performance Interview

Students and teaching assistants were trained in the performance interview procedure prior to the onset of instruction. The roles of interviewer and interviewee in this verbal exchange were as follows. The task of the interviewer was to serve as a skilled listener to whom the interviewee could demonstrate his newly acquired verbal behavior. The interviewer's role was to encourage, strengthen, and supplement behavior which was potentially in the interviewee's repertoire and to evaluate the completeness of his verbal coverage of the material. It was not the function of the interviewer to serve as a tutor. It was his function to reinforce the appropriate verbal behavior of the interviewee, who was the primary speaker.

It was considered the task of the interviewee to explain succinctly, in his own words, the principal issues of the course material which he had studied. Memorization was not required; therefore, both interviewer and interviewee could use the text, notes, or outlines to refer to as he was speaking or listening. Understanding, organization, and condensation of information were of primary importance since the interview was limited to approximately 10 to 15 minutes.

As Ferster & Perrott (1968) have pointed out, in this method the student, who is primarily a listener in the conventional classroom, becomes instead an active participant. He is required not only to understand and process the information presented in the text, but also to demonstrate verbally the competence which he has acquired from his study of the course materials. Unlike the traditional testing approach, which tends to develop in the student only a minimal behavior necessary to pass, the interview requires mastery of the material and serves as a direct measure of the student's entire repertoire (Ferster & Perrott, 1968). There is no penalty for incomplete coverage on an interview. There is instead an opportunity to reinterview until mastery of that

particular segment of the material is demonstrated.

In a functional analysis of the interview the presence of the interviewer and the interview situation provide the discriminative stimuli for the emission of the desired behavior. The desired behavior is a satisfactory verbal demonstration of mastery of a segment of course content. The desired behavior is systematically reinforced by the interviewer both by verbal social reinforcement of praise and approval and by the mutual decision that an interview has been completed, thus denoting progress through the course. Because the interviewee is speaking in detail about a small amount of material there is a fine-grain relationship between the performance in the interview and the preceding study behavior. In addition, the interviewee is his own listener, differentially reacting to his own fluency, accuracy, and depth of coverage and thus differentially reinforcing those aspects of his study behavior which have produced a competent performance (Ferster, 1968). The interview technique, then, generates the kind of study behavior needed to achieve mastery and the fluency needed to convey the knowledge (Ferster & Perrott, 1968).

Procedures

The experiments took place during the first hour and one-half of the three hour class periods each week for a period of 10 weeks. The first hour was the instructional period, when course material was presented by means of one of the three approaches with the aid of the teaching assistants. Following the instructional period a brief (approximately 10 minutes) question and answer period was used for clarifying any questions which arose during the instructional period. At the conclusion of the question and answer period, the weekly examination was administered.

In Experiment I the small group discussion was employed in Group I during the baseline period (weeks 1 and 2). The performance interview was employed during the first experimental period weeks (3, 4, and 5). In the return to baseline period (weeks 6 and 7) the small group was again used, and in the second experimental period (weeks 8, 9, and 10) the performance interview was used. In Group II the sequence of conditions was reversed so that weeks 1 and 2 constituted the first experimental period, in which the performance interview was used. Group II received a BABA series of conditions rather than the ABAB series. All students received the same

quiz each week.

In Experiment II the teaching assistant for Group I employed the lecture method for the duration of the baseline period and for the return to baseline period. During the experimental periods the interview was used. As in Experiment I, the sequence of conditions was reversed for subjects in Group II.

Analysis of the Data

The data were analyzed functionally and presented in the form of discrete curves for each subject observed in order to demonstrate performance differences among treatment conditions and to show trends within conditions. Attending data were plotted graphically in the form of percentages. Responding data were plotted graphically in the form of frequency of response.

Raw test scores were transformed into Z scores for purposes of comparison in graphic form. In addition, group means were computed in order to compare the performance of each group as a whole under baseline and experimental conditions. A simple *t* test was performed to determine the significance of the differences between the means.

CHAPTER V

RESULTS

An intra-subject replication design was used to demonstrate the functional relationship between the independent variables and the observed behavior. To determine the significance of the difference between group performance under baseline conditions and group performance under experimental conditions a simple t test was performed.

In Experiment I there was no significant difference (t=.3445) between test performance during baseline conditions (small group discussion) and test performance during experimental conditions (performance interview). In Experiment II, however, there was a significant difference ($p<.05$, t=2.11) between test performance during baseline conditions (lecture) and test performance during experimental conditions (performance interview). Test scores obtained during experimental conditions were significantly higher than those obtained during baseline conditions.

Groups receiving a reversed sequence of conditions (BABA) were also analyzed separately from those receiving

the ABAB sequence. The scores of subjects who received the reversed sequence were significantly higher ($p<.05$, $t=2.90$, $t=5.64$) during the experimental conditions for subjects in both experiments. In both experiments scores of students in the ABAB sequence were not significantly different between baseline and experimental conditions.

A single subject behavioral analysis employing discrete curves was also used in formulating the results of this study. In both experiments raw test scores on weekly examinations were transformed into Z scores and plotted for each subject (See Figures 1-28).

As Figures 1 through 28 indicate, for a majority of the subjects (17) a functional relationship between teaching methodology and individual test performance was apparent. For 15 subjects the experimental conditions produced a higher operant level than did the baseline conditions. Two subjects demonstrated the opposite trend of lower test performance during experimental conditions. For 11 subjects test performance was erratic and did not appear to be functionally related to the teaching method used.

In Experiment I, where the baseline condition was small group discussion, two subjects demonstrated a positive

trend, one a negative trend, and four no trend. In Experiment II, where the baseline condition was the lecture, 13 subjects showed a positive trend, one showed a negative trend, and seven showed no trend.

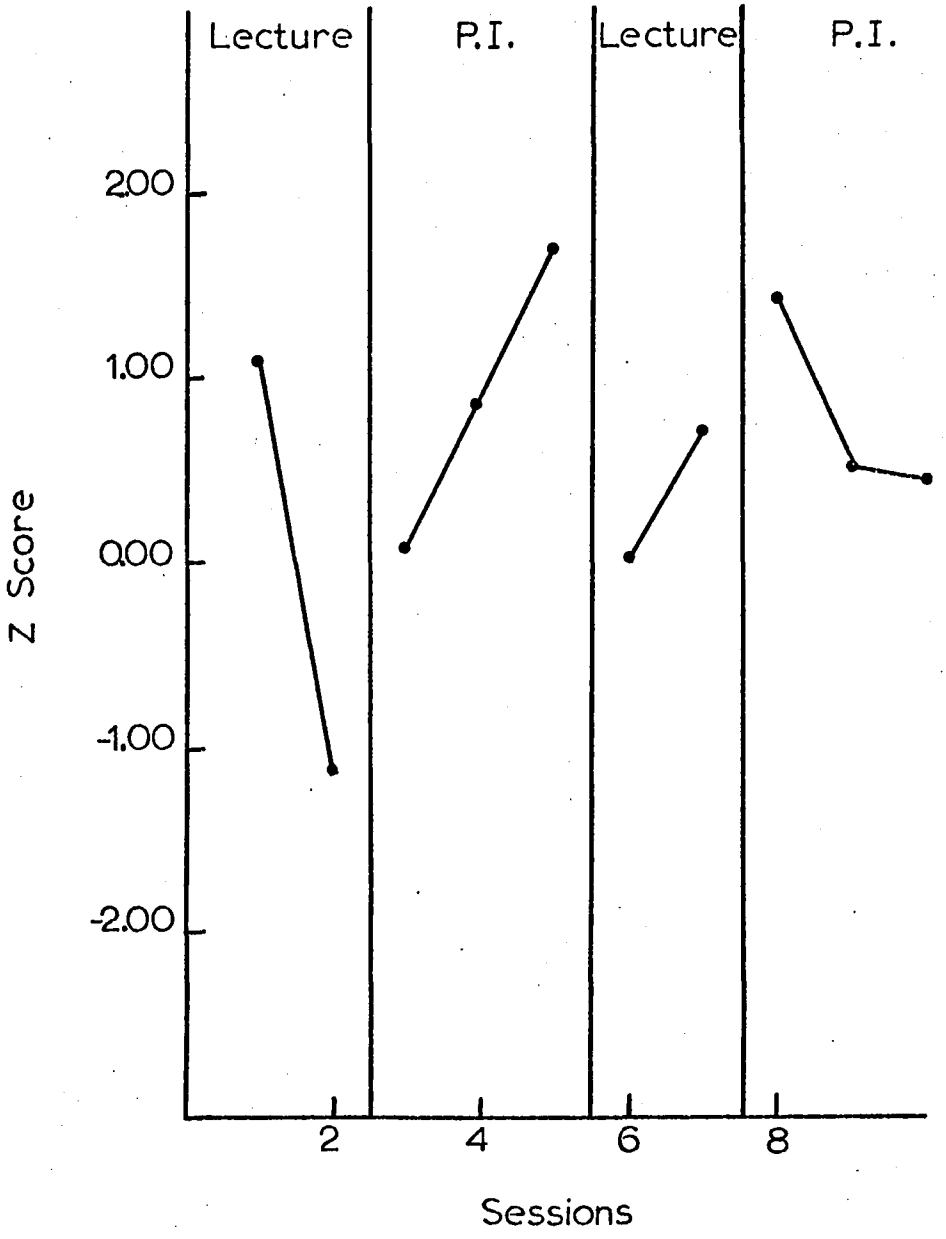


Fig. 1. Test performance for subject 1.

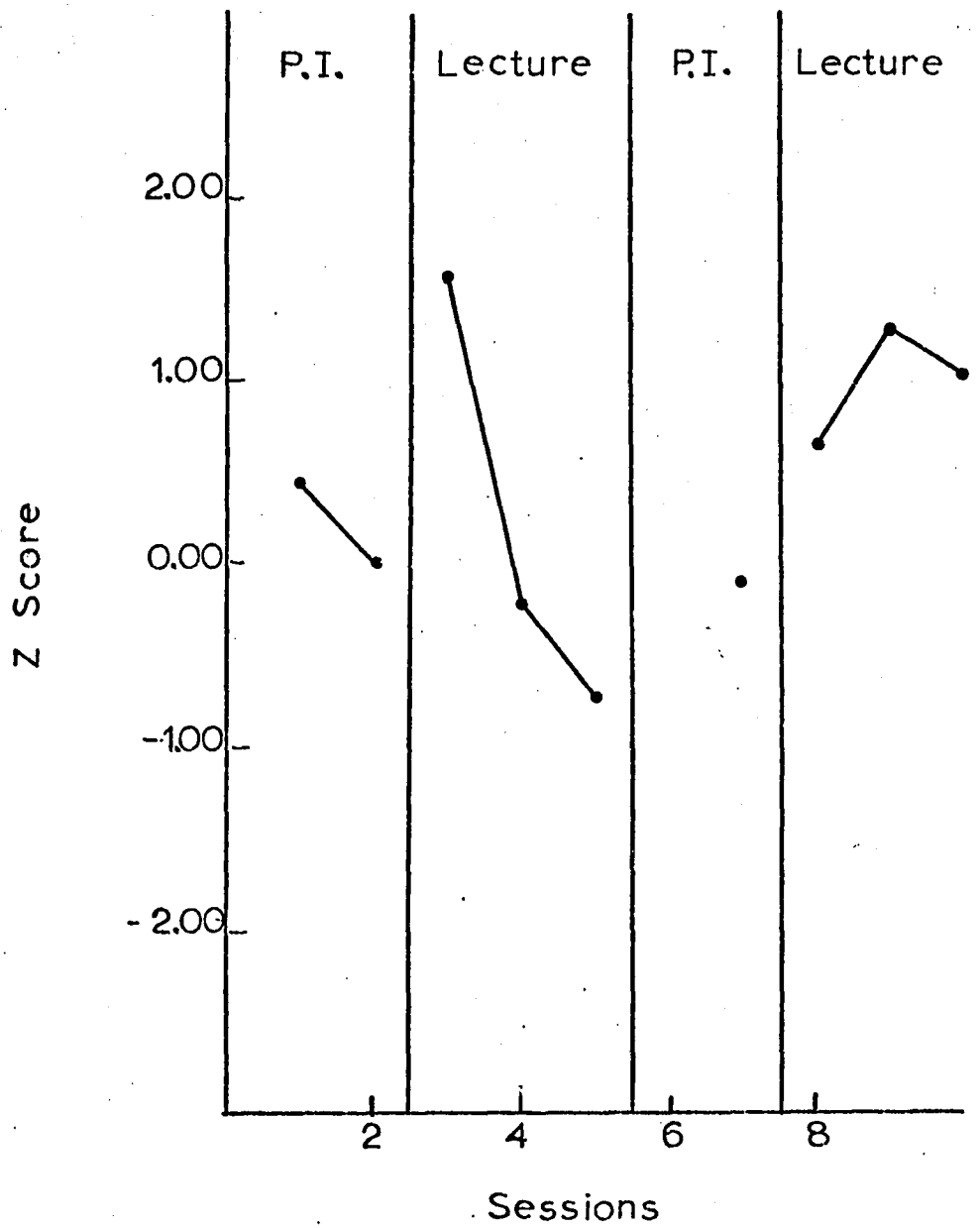


Fig. 2. Test performance for subject 2.

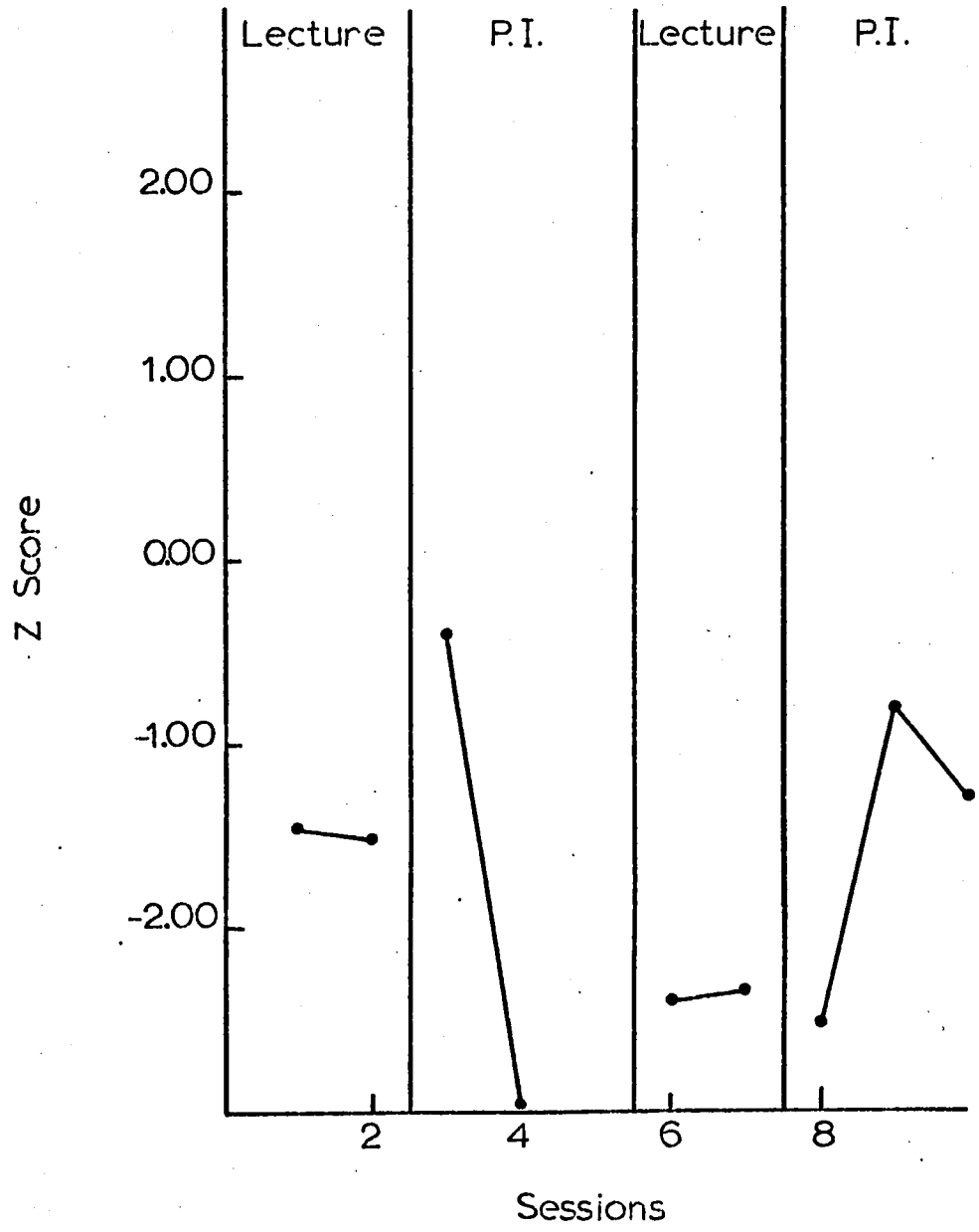
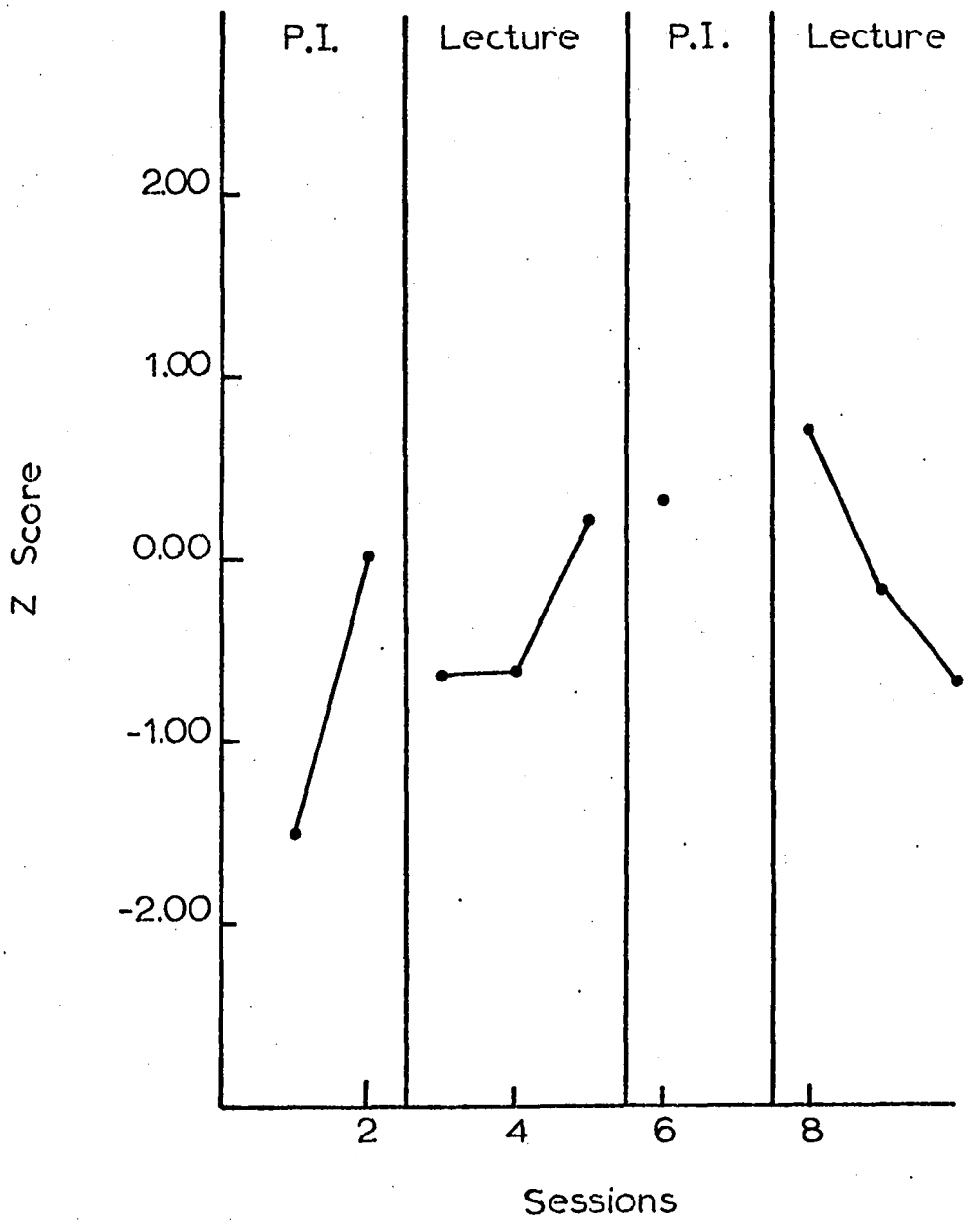


Fig. 3. Test performance for subject 3.



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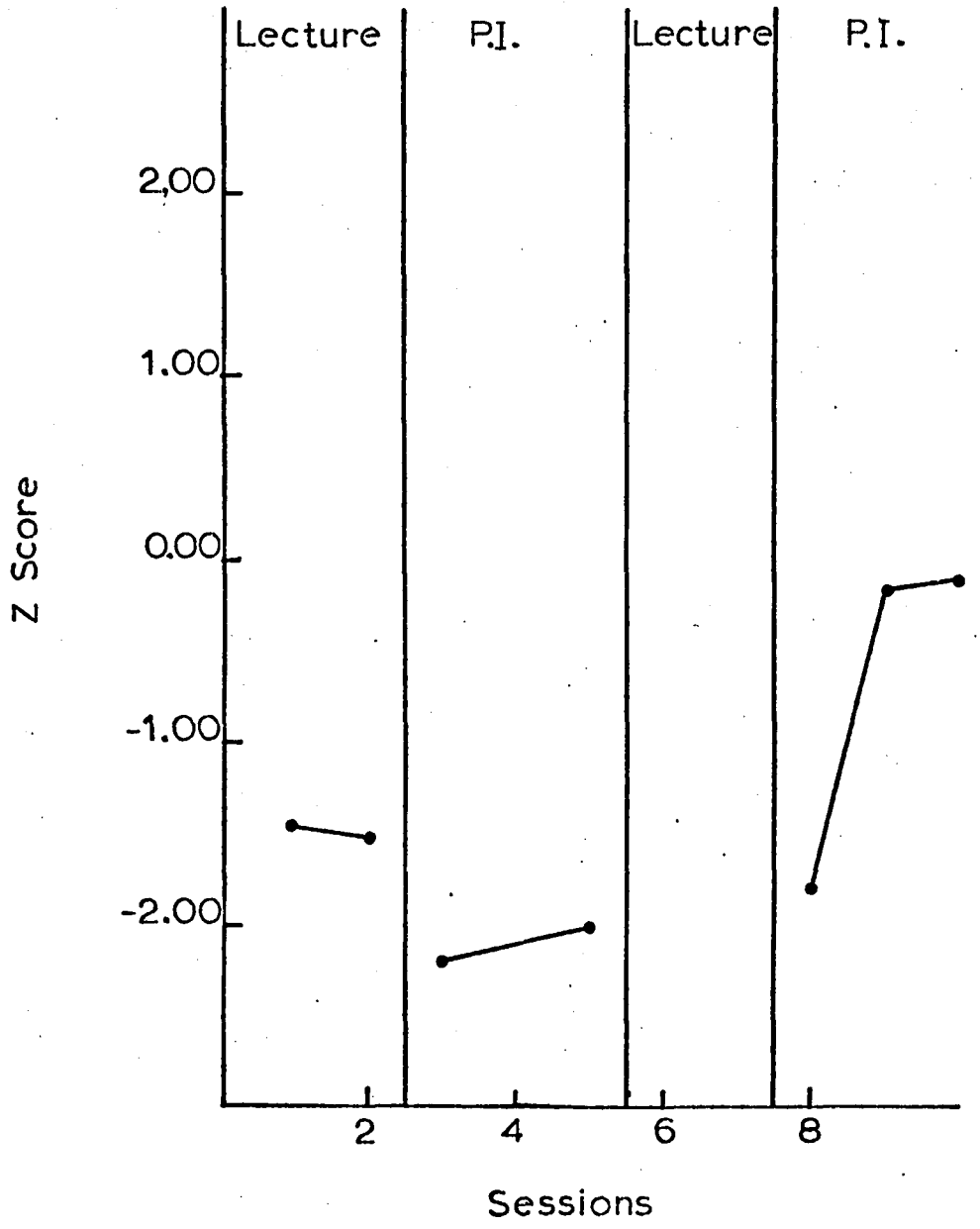

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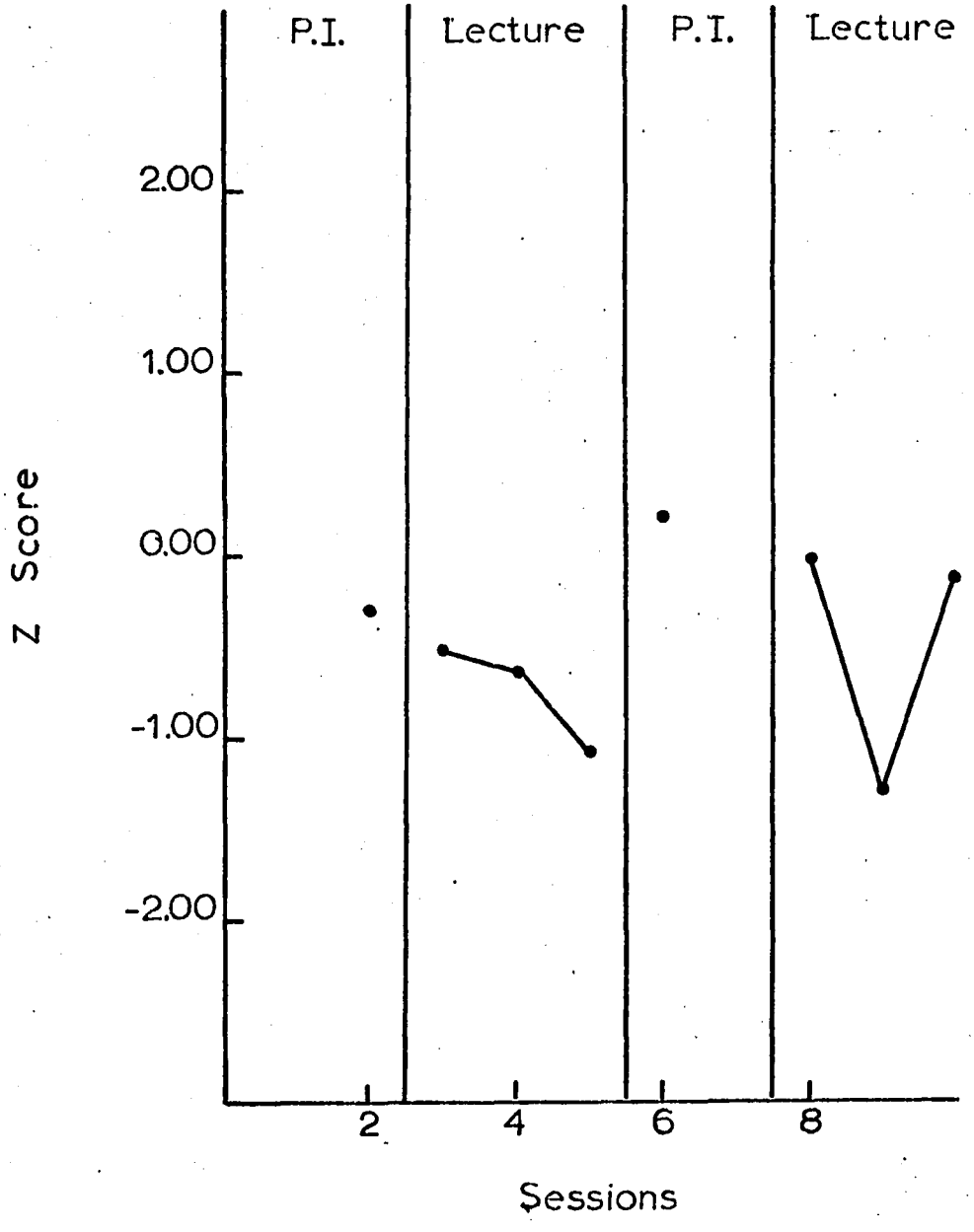

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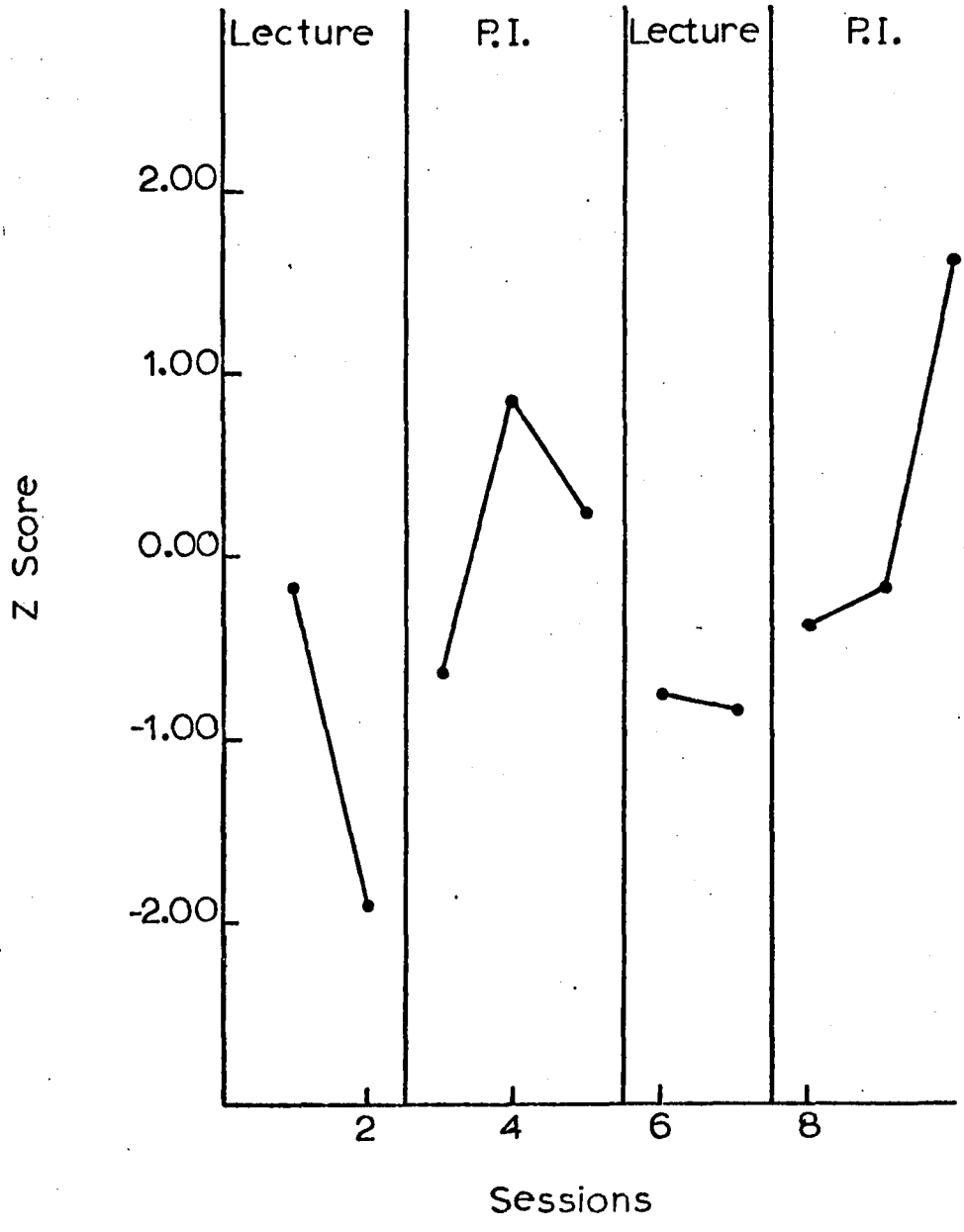

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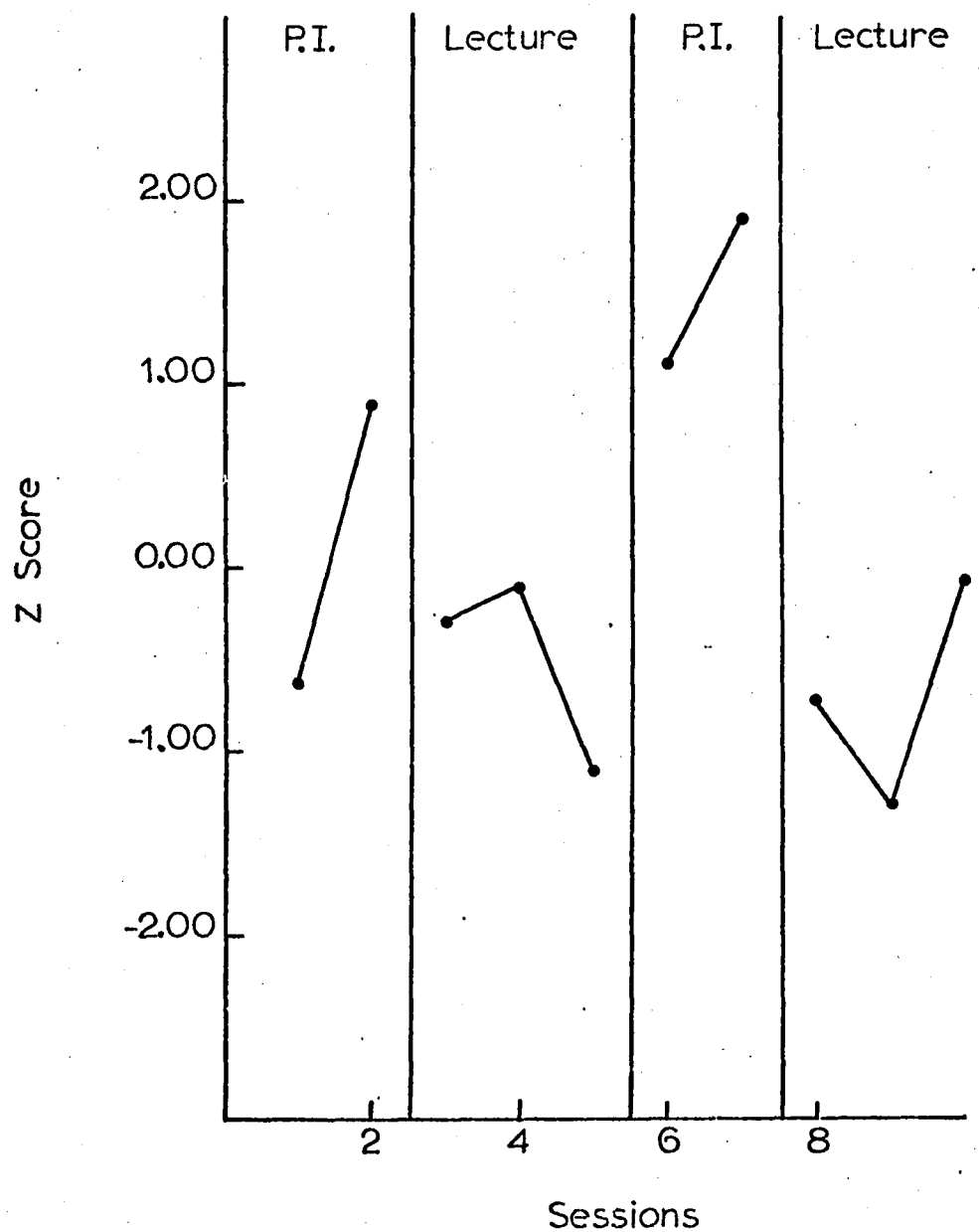

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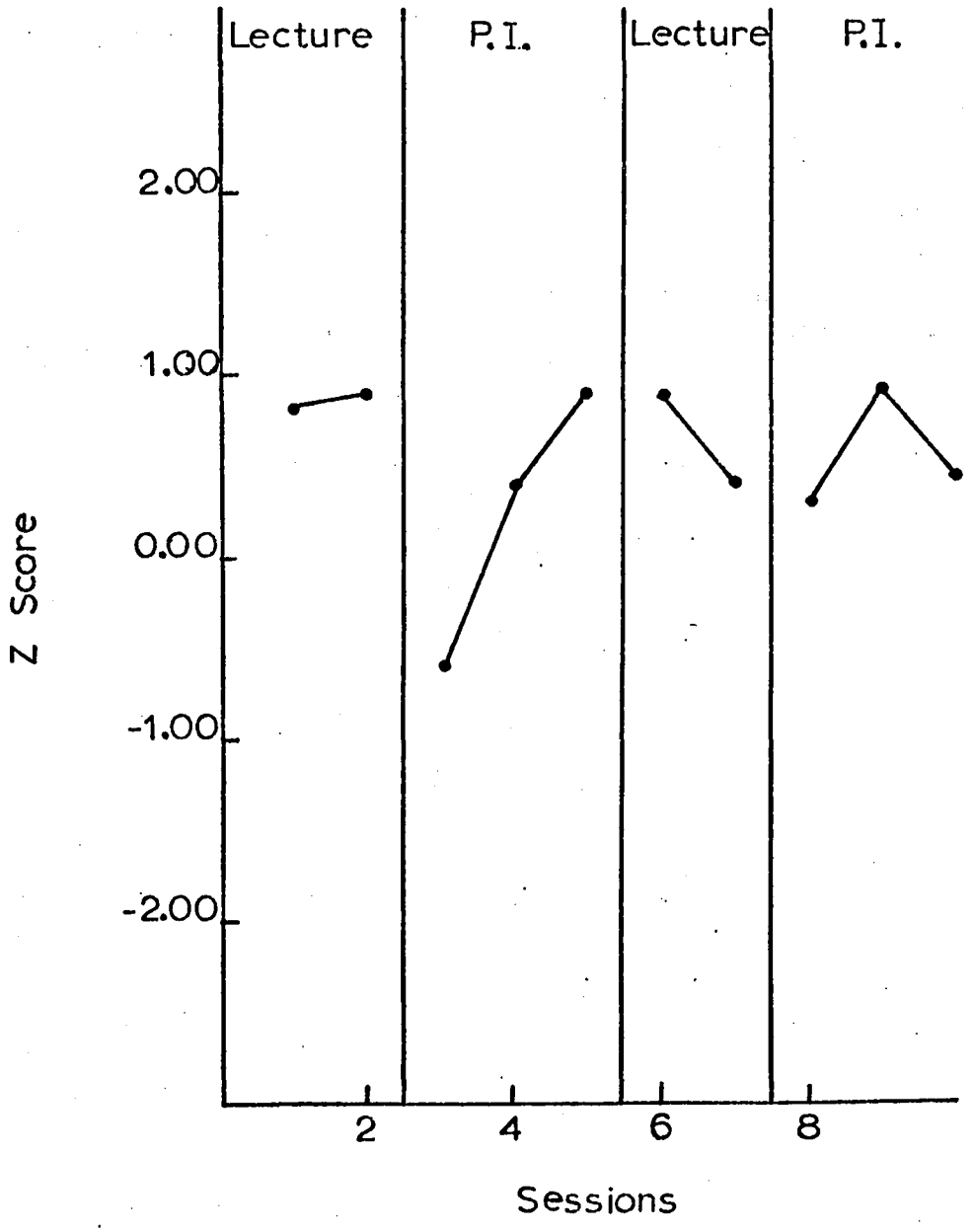

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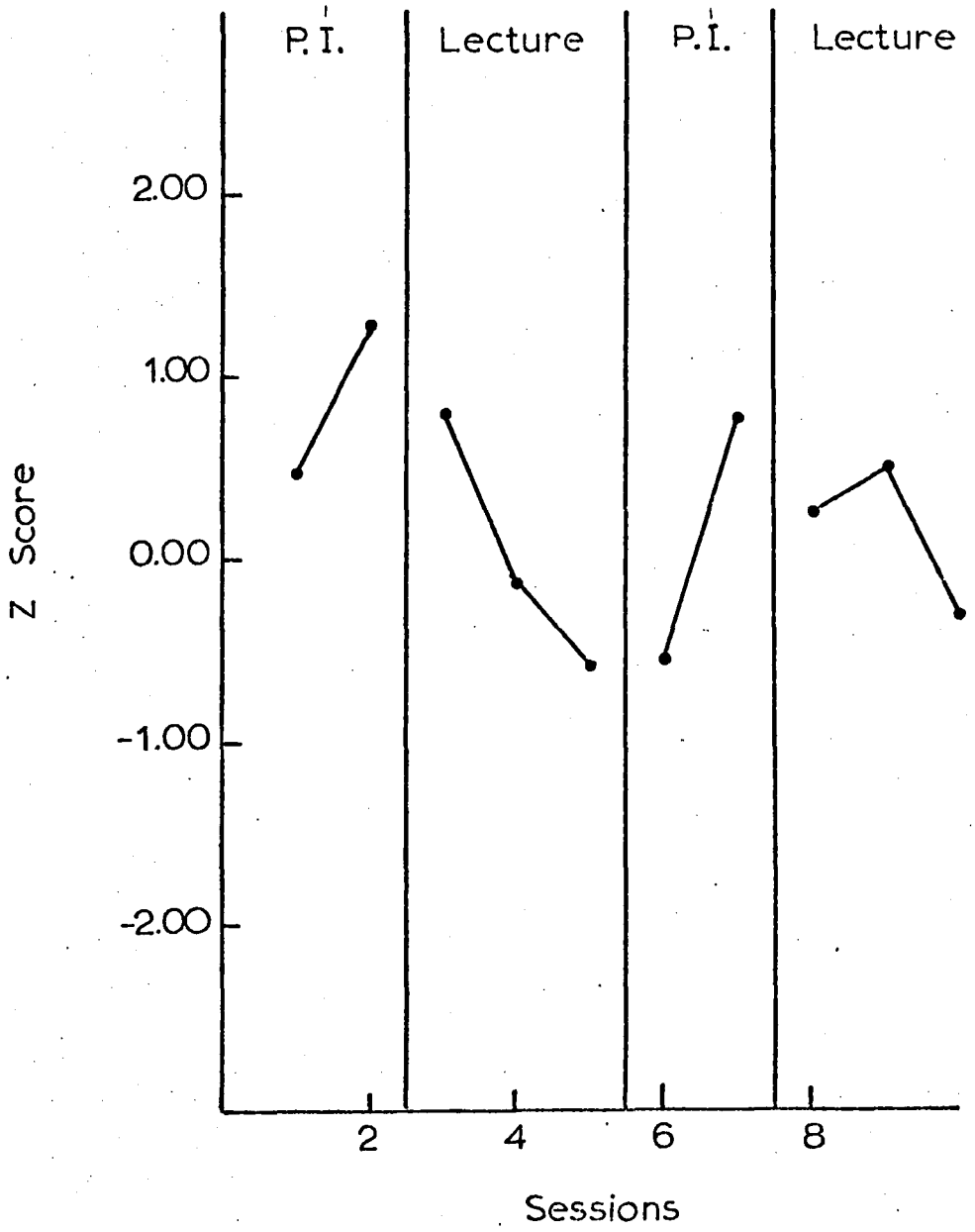

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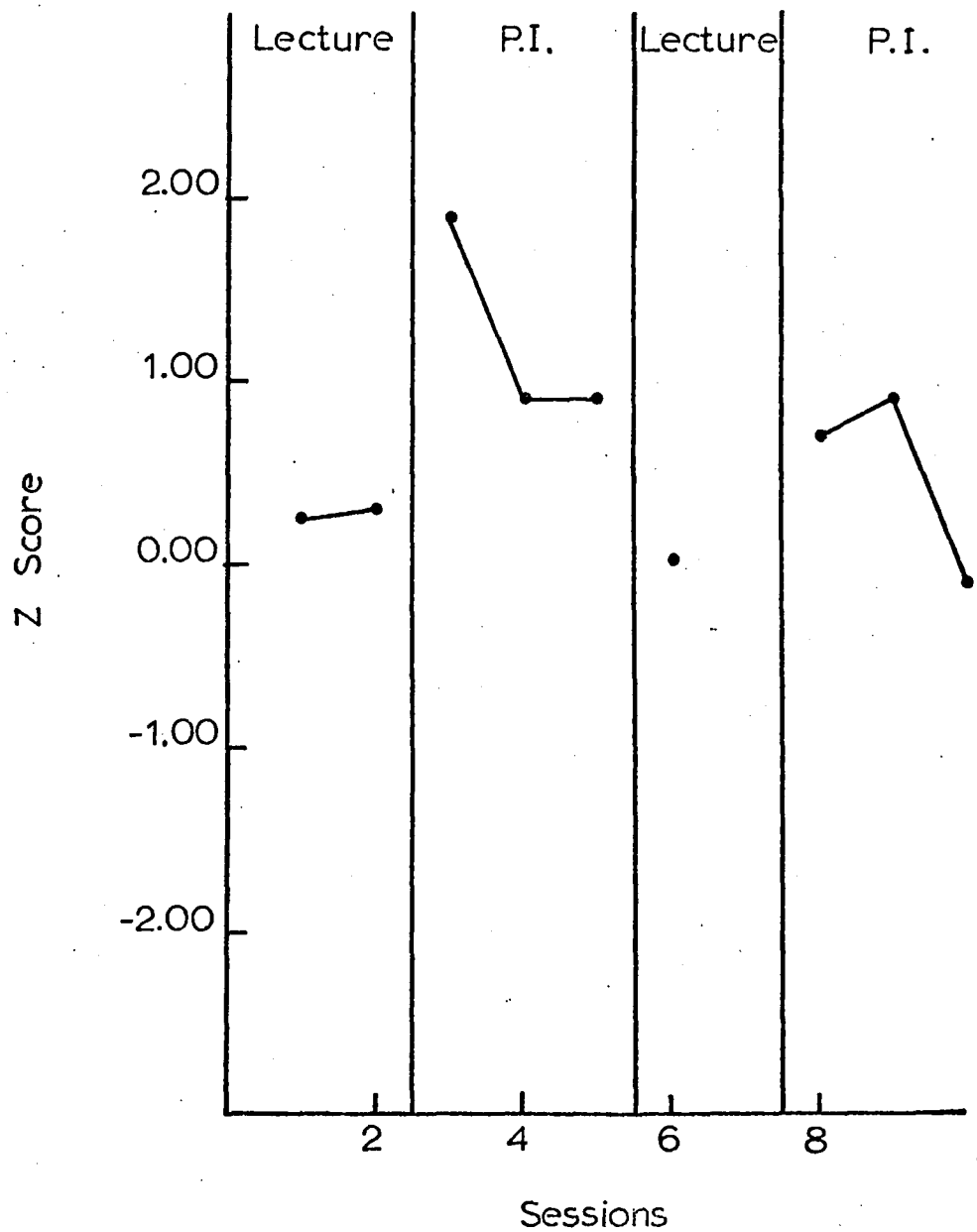

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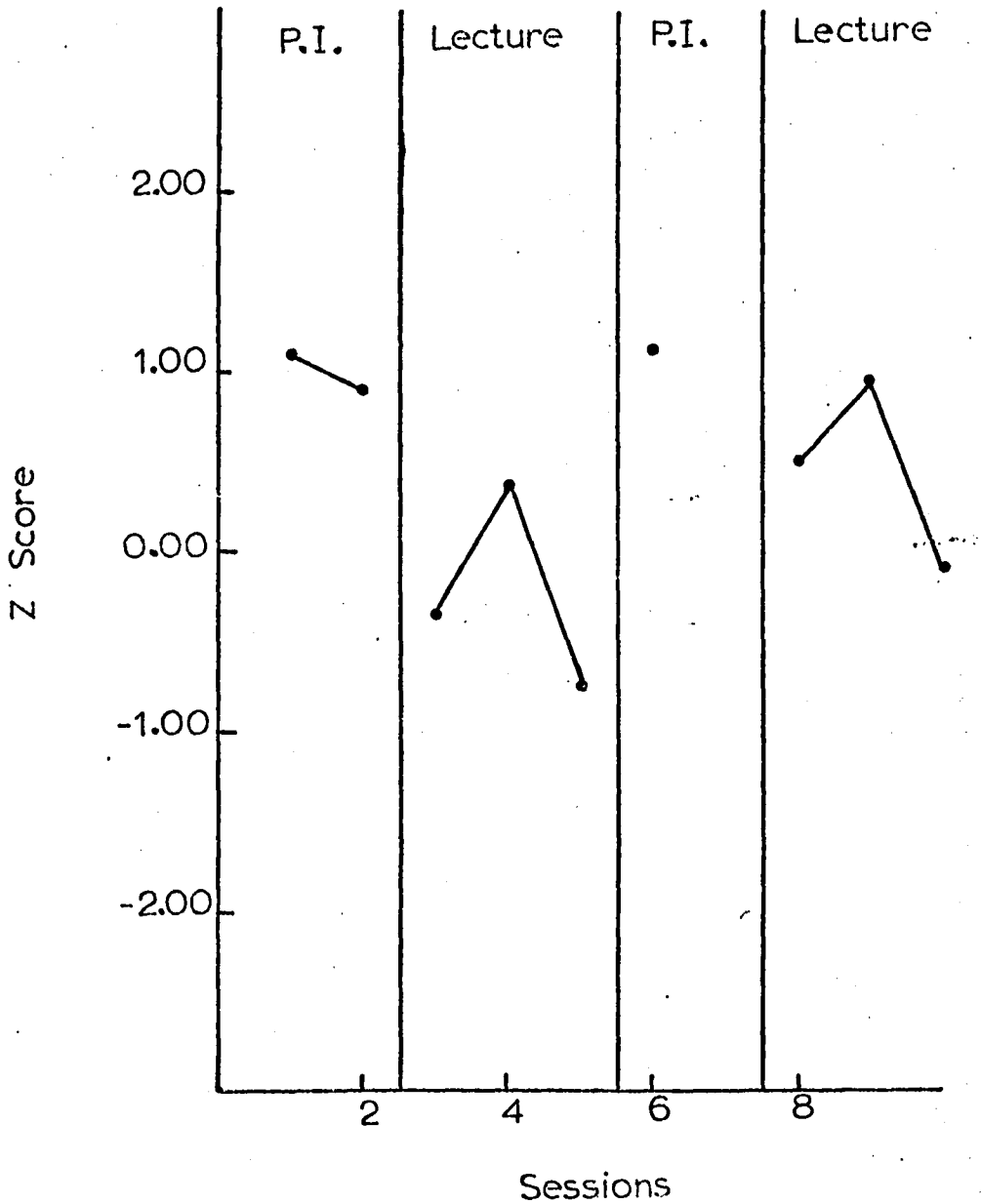

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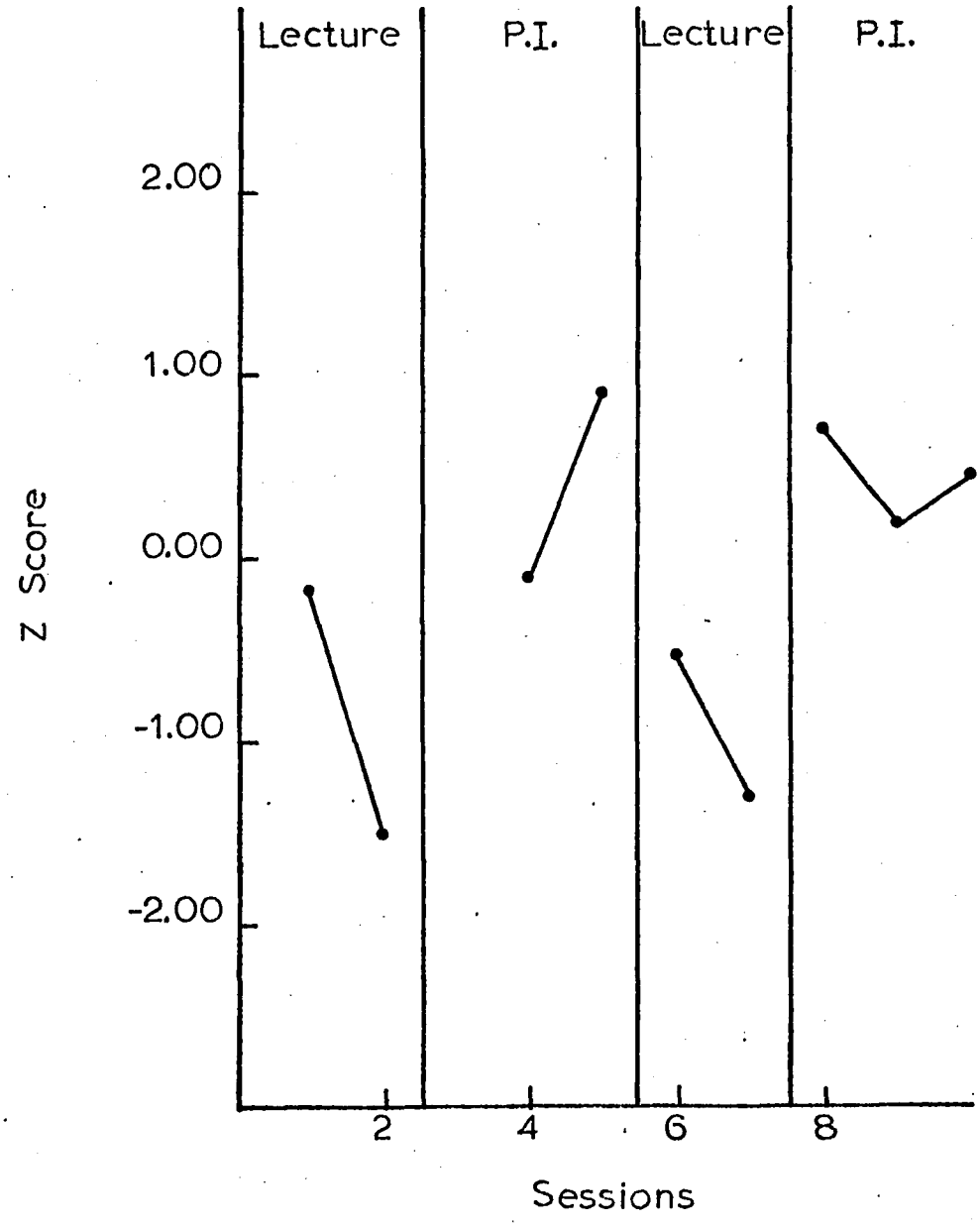

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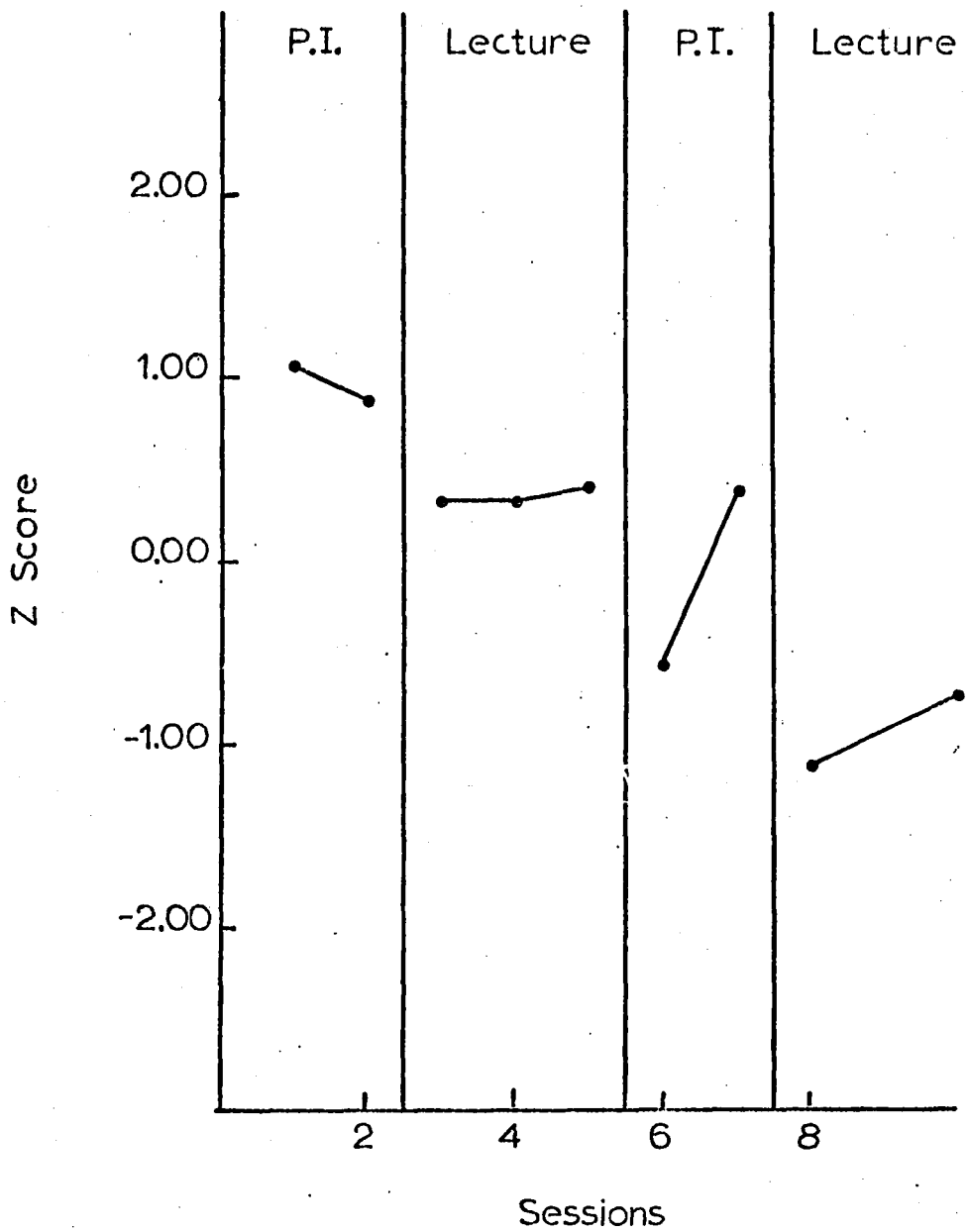

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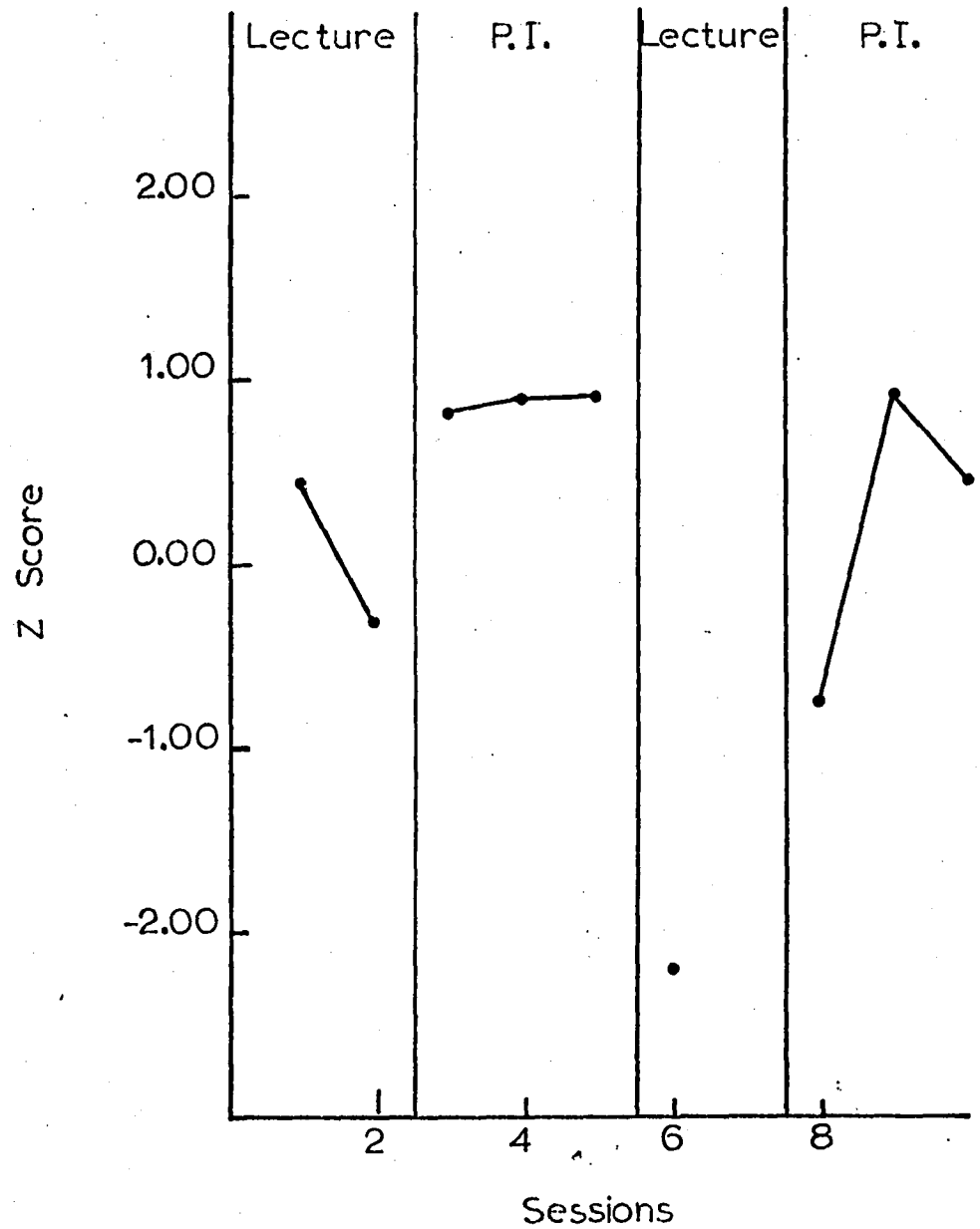

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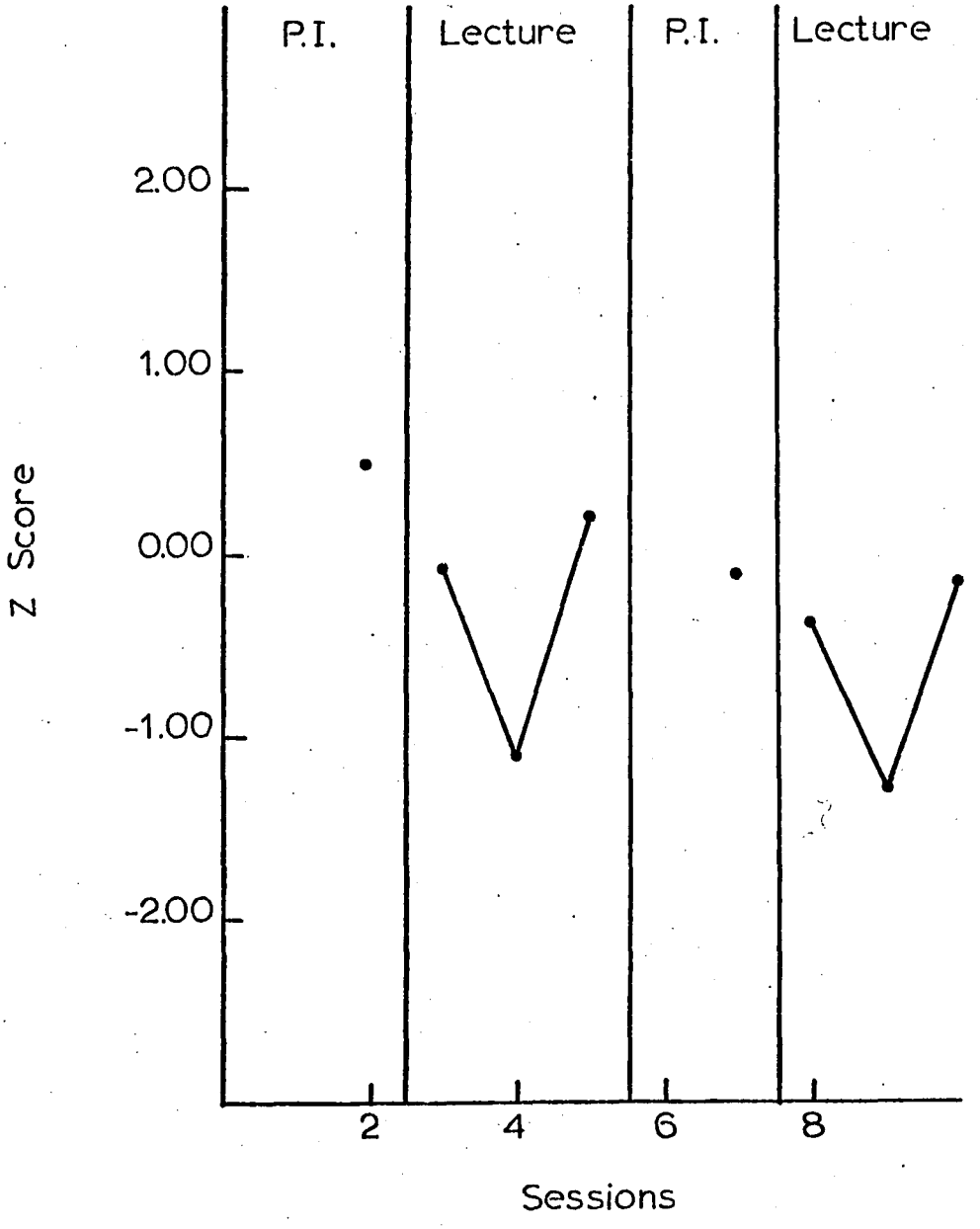

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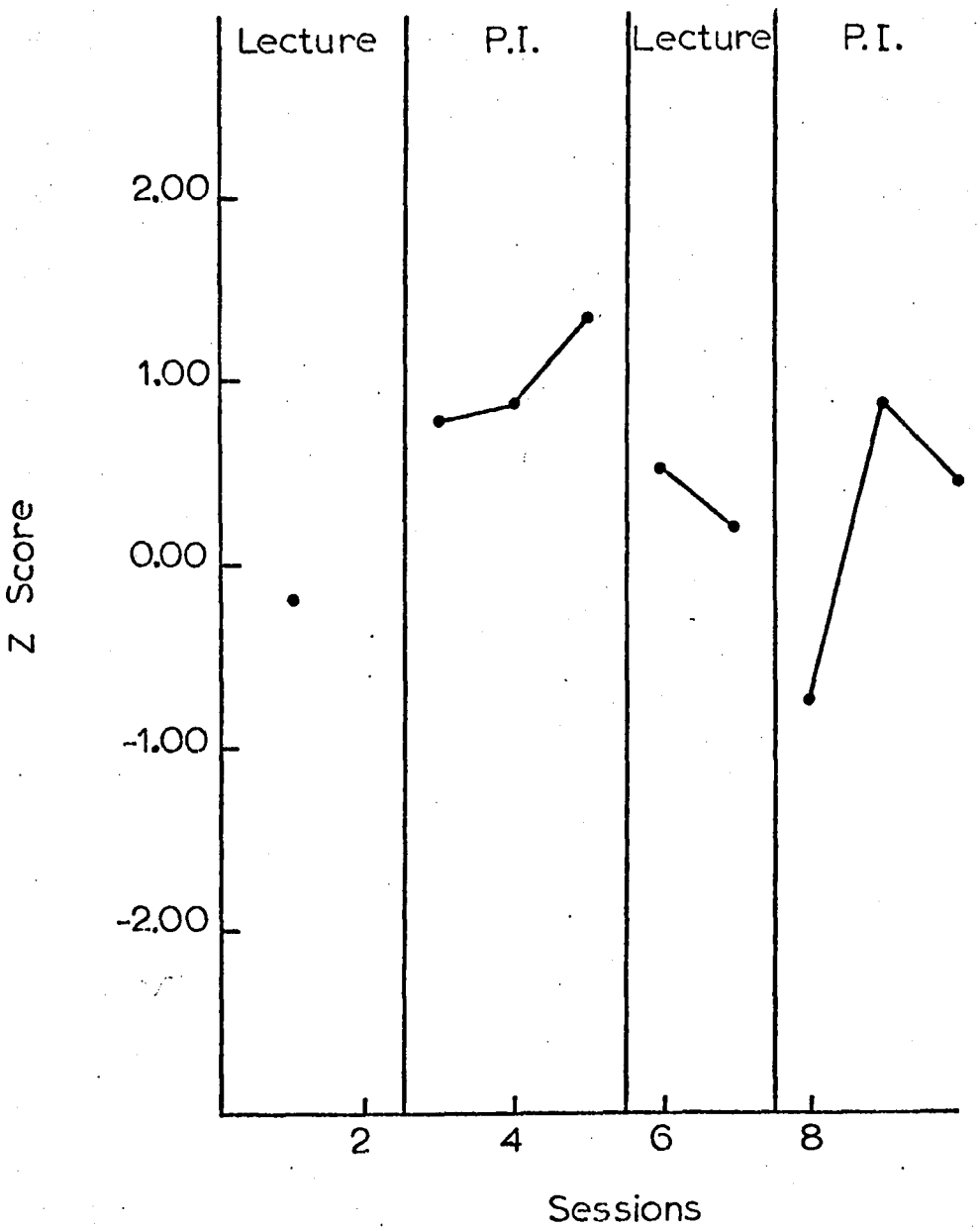

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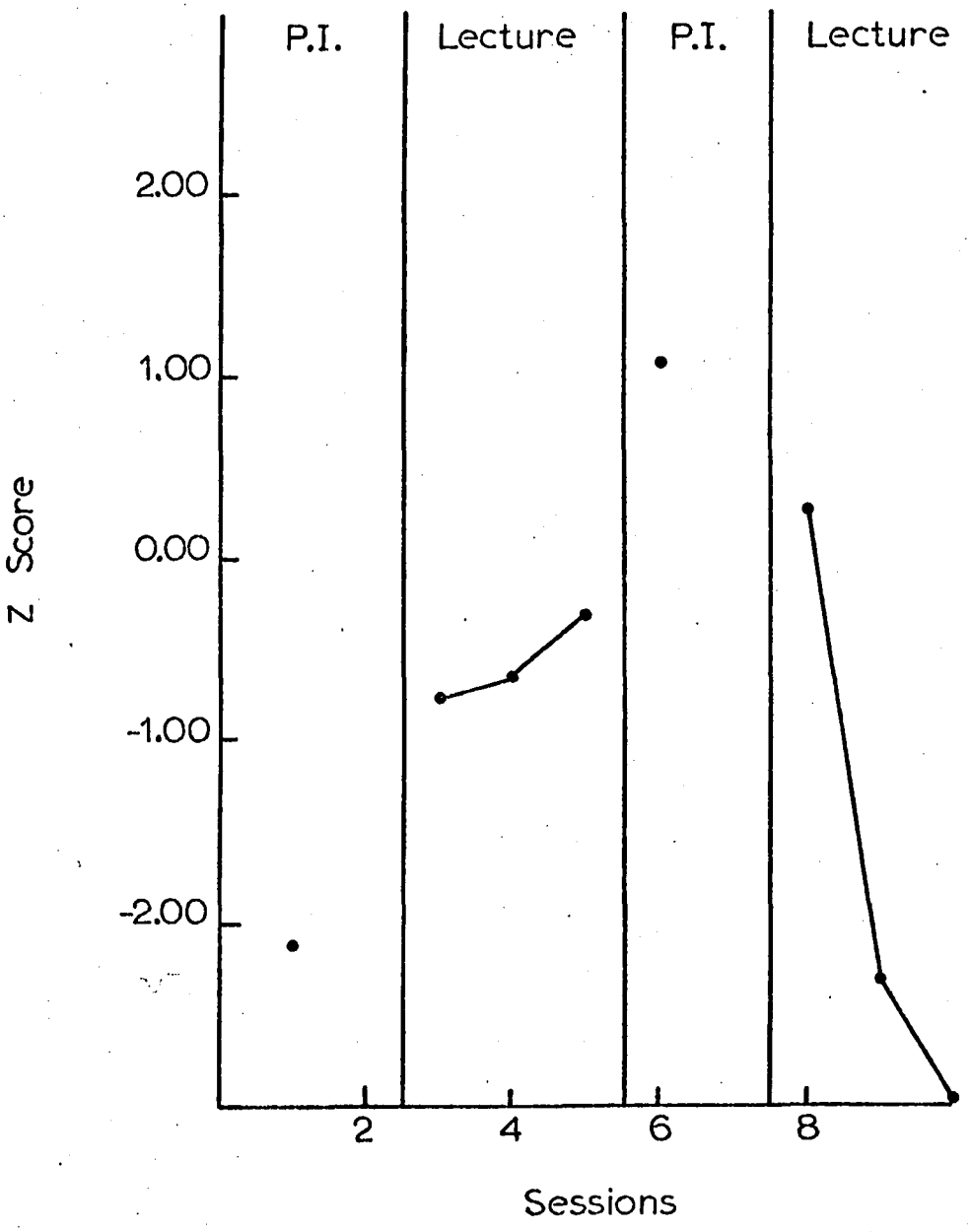

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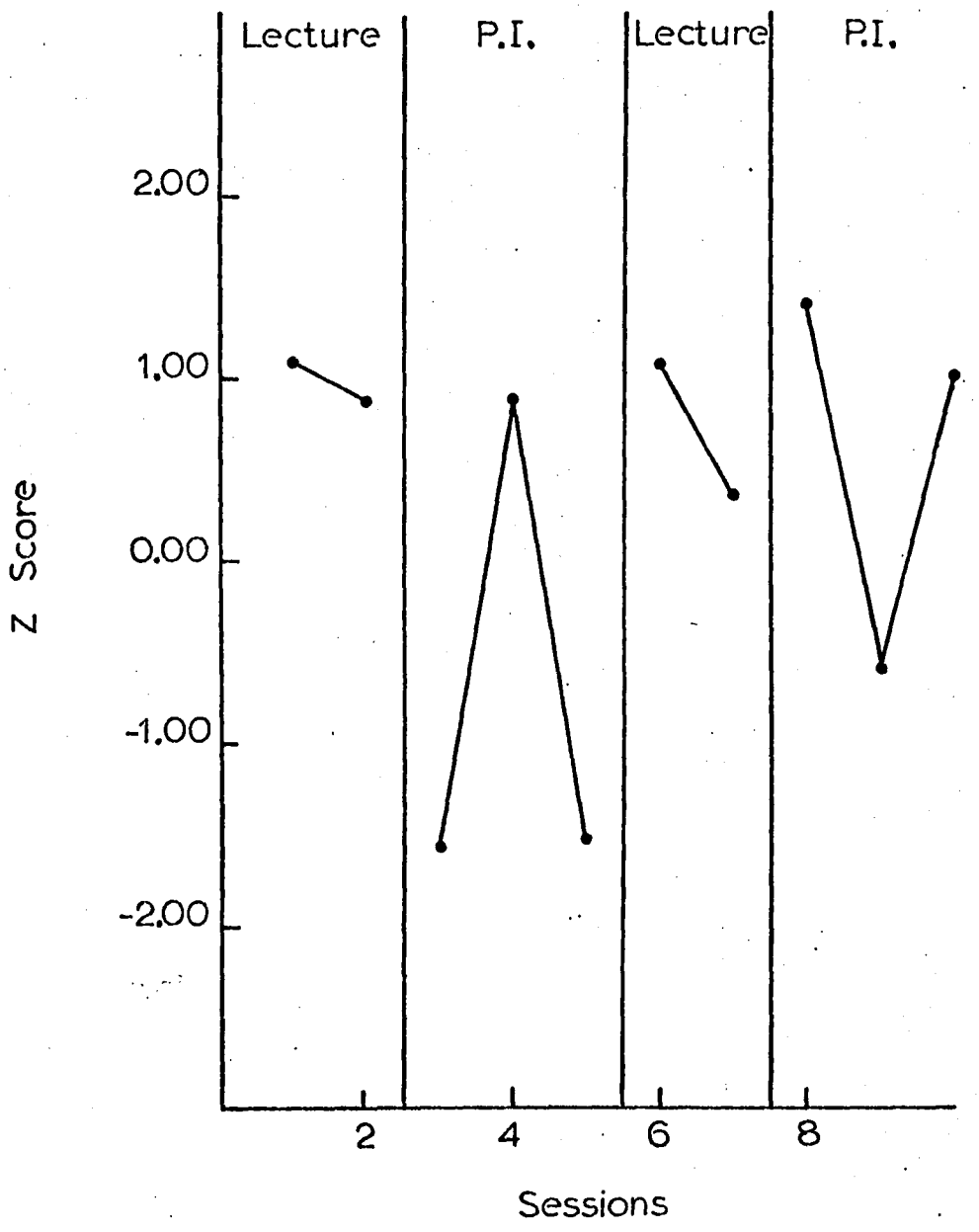

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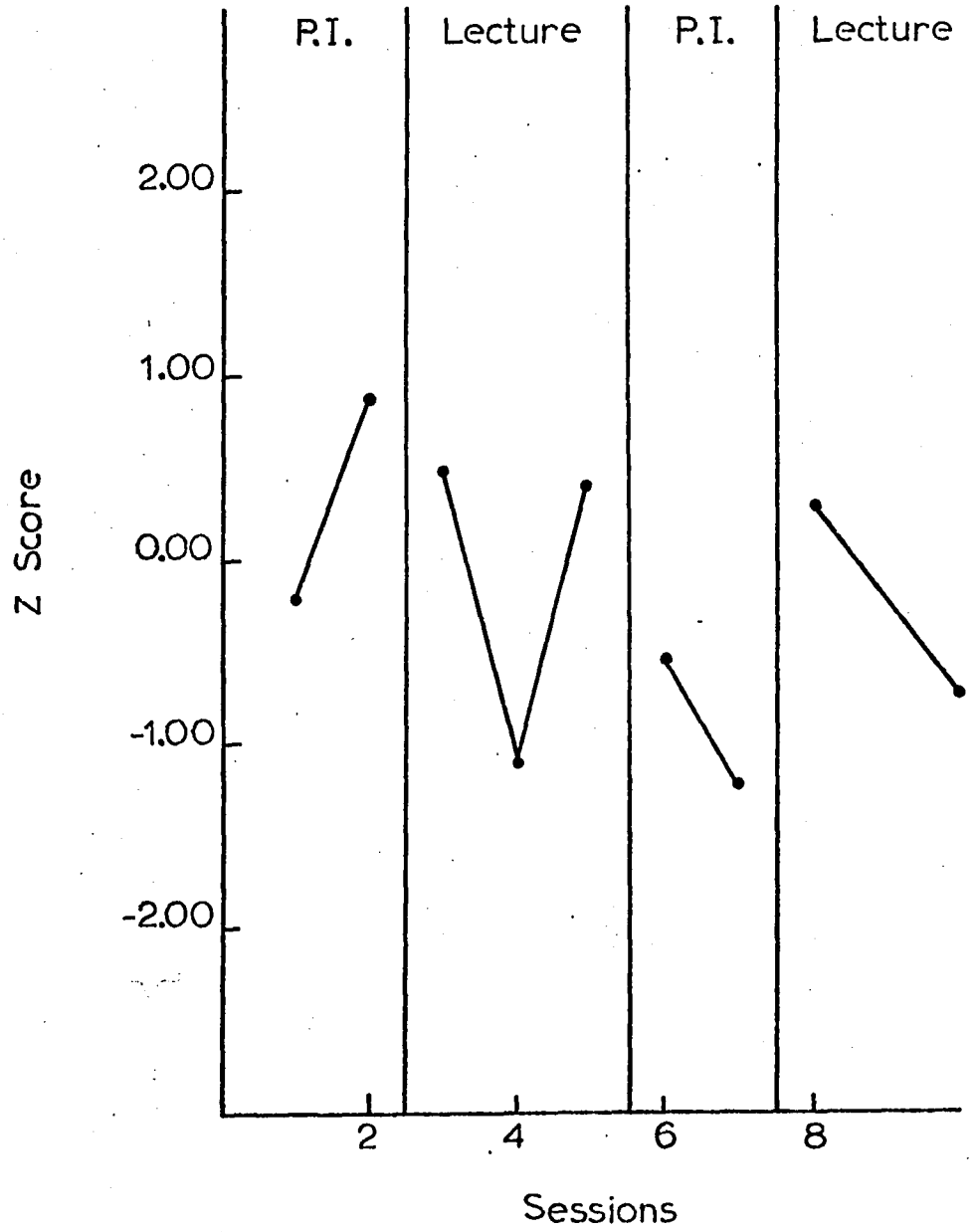

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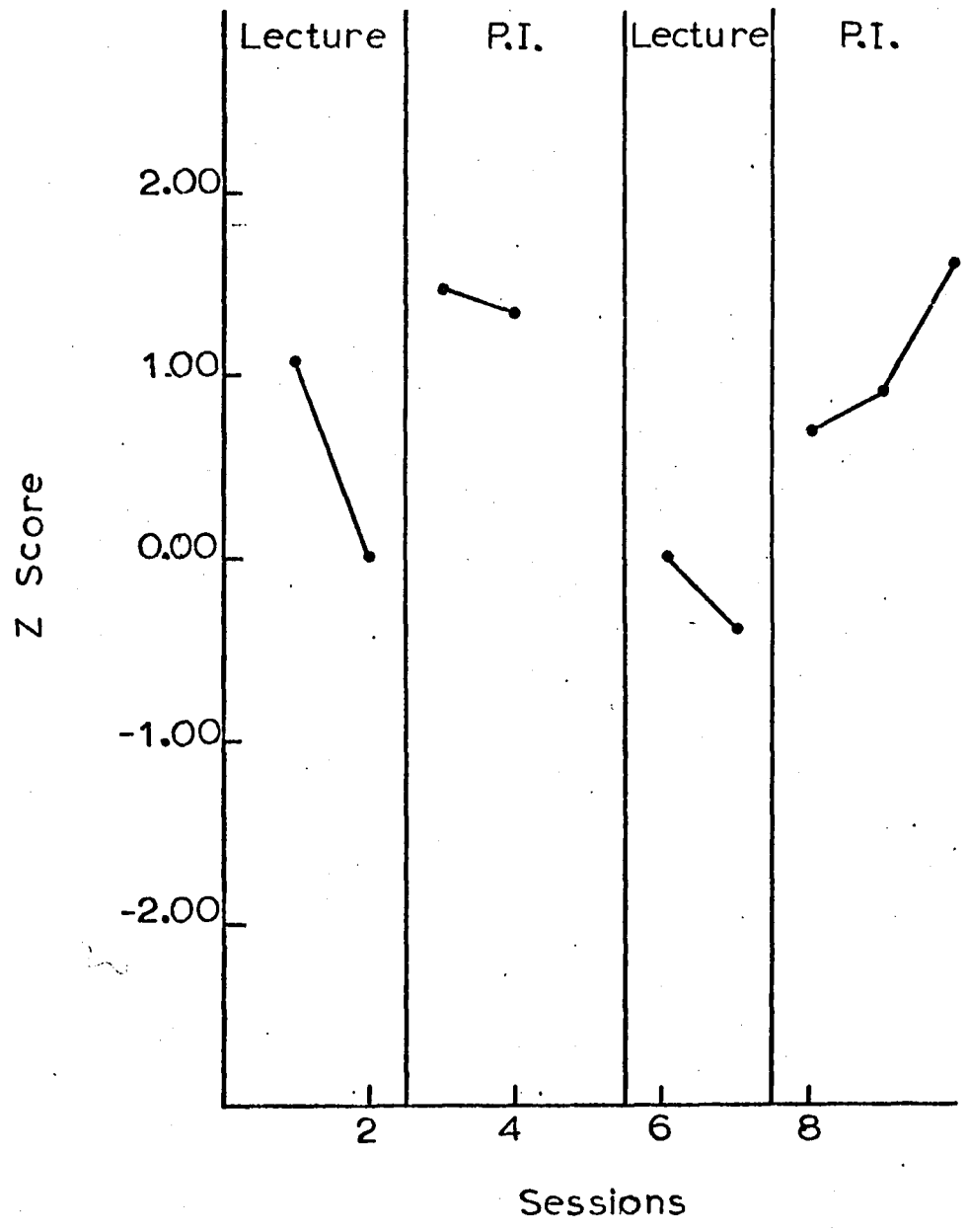

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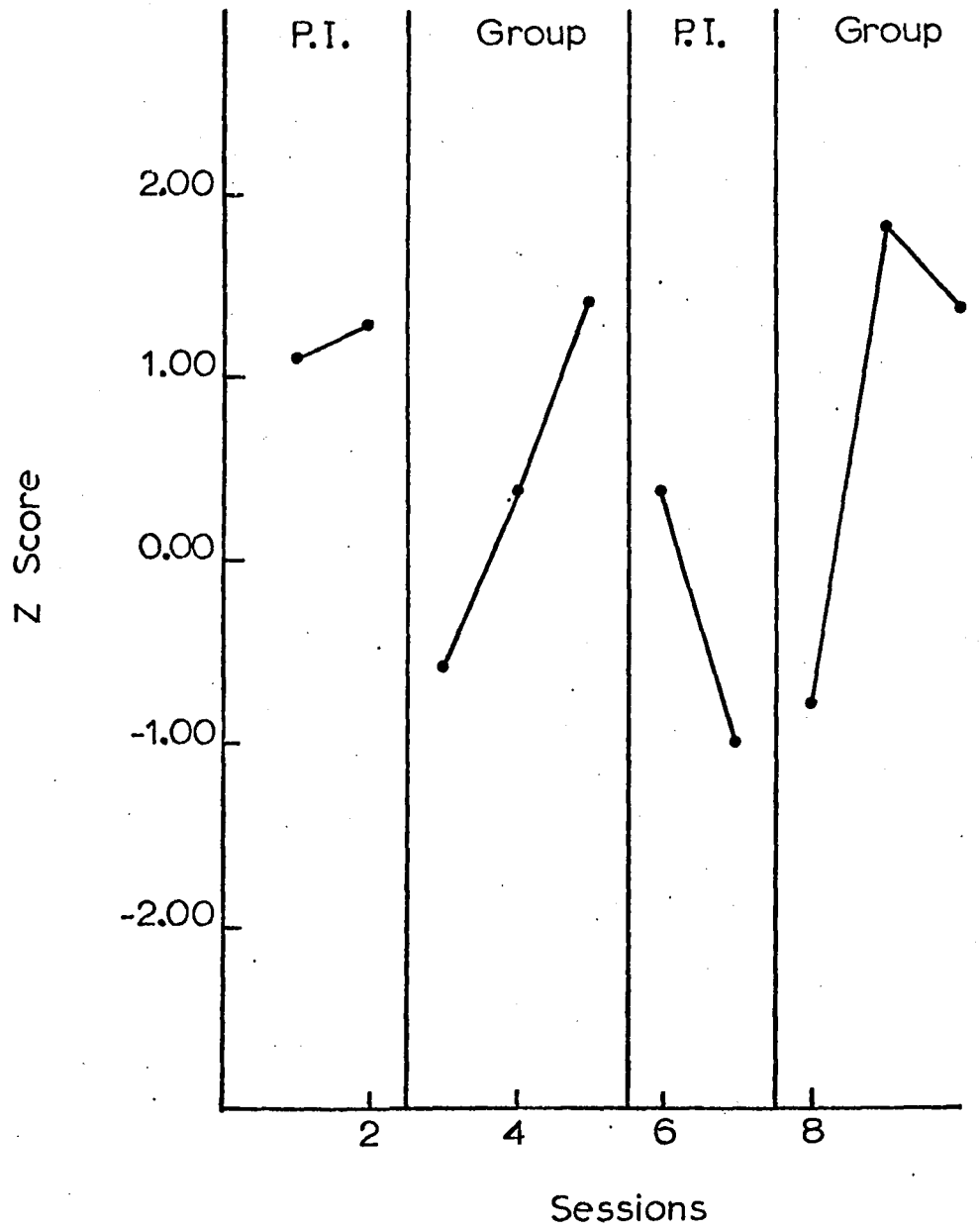

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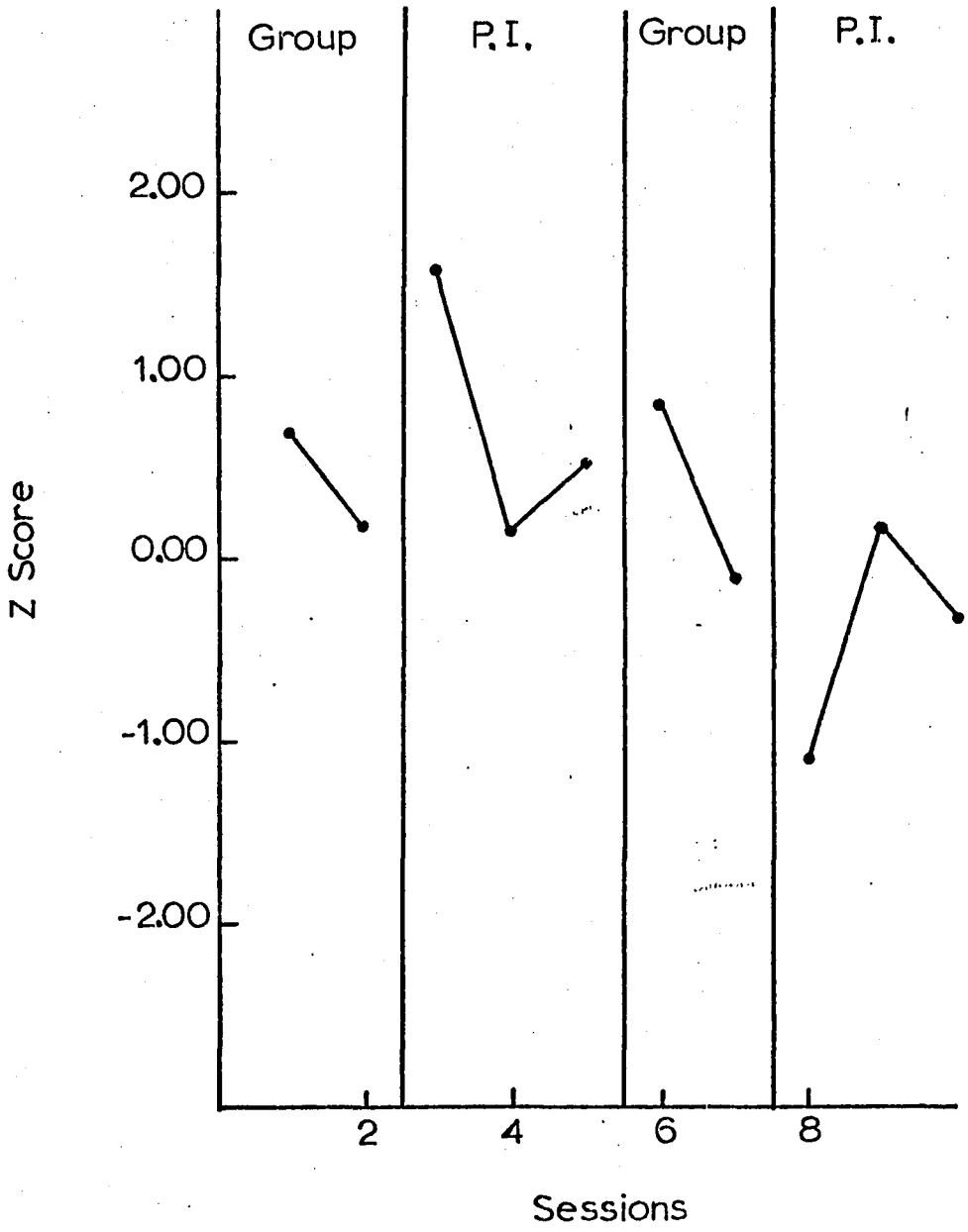

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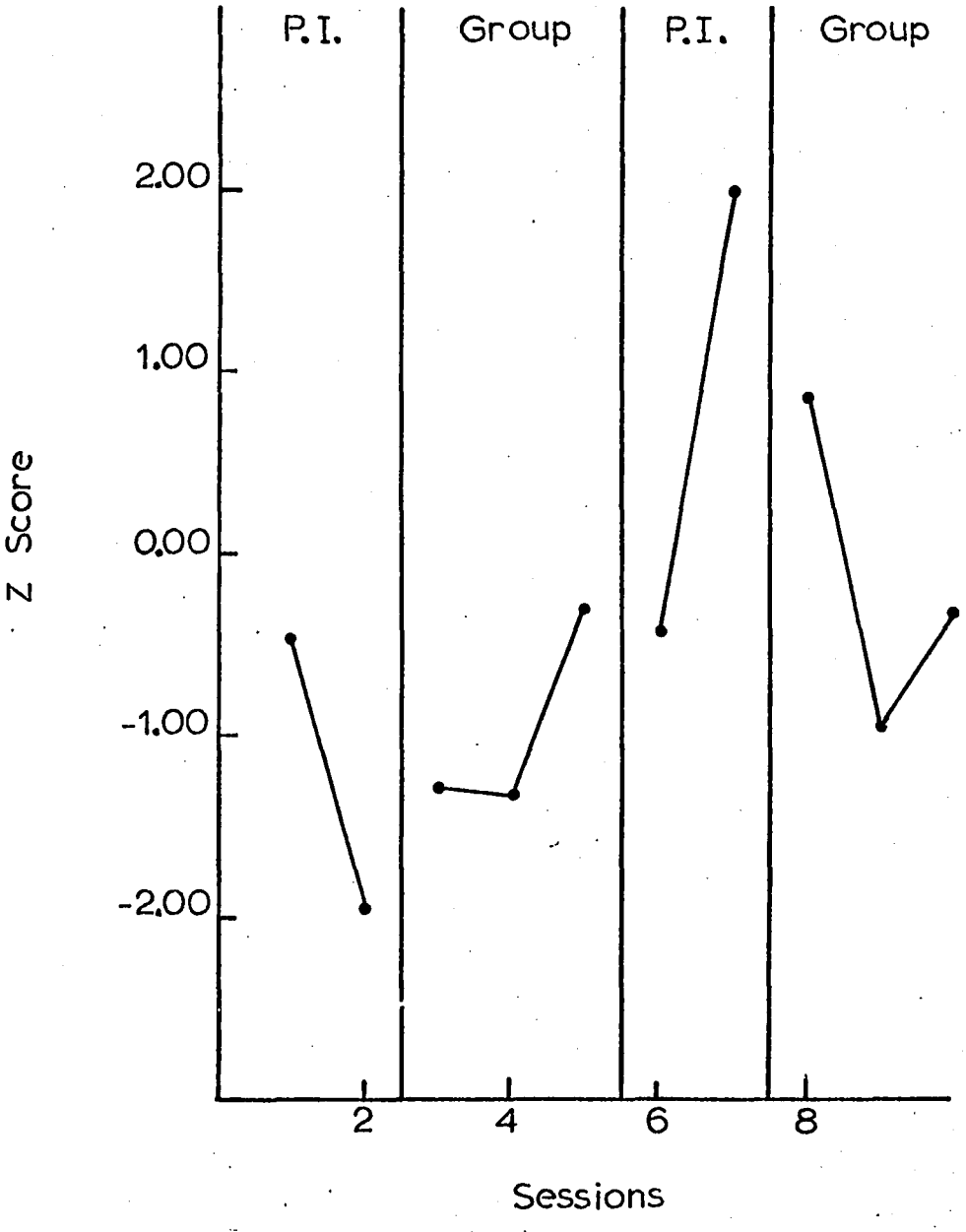

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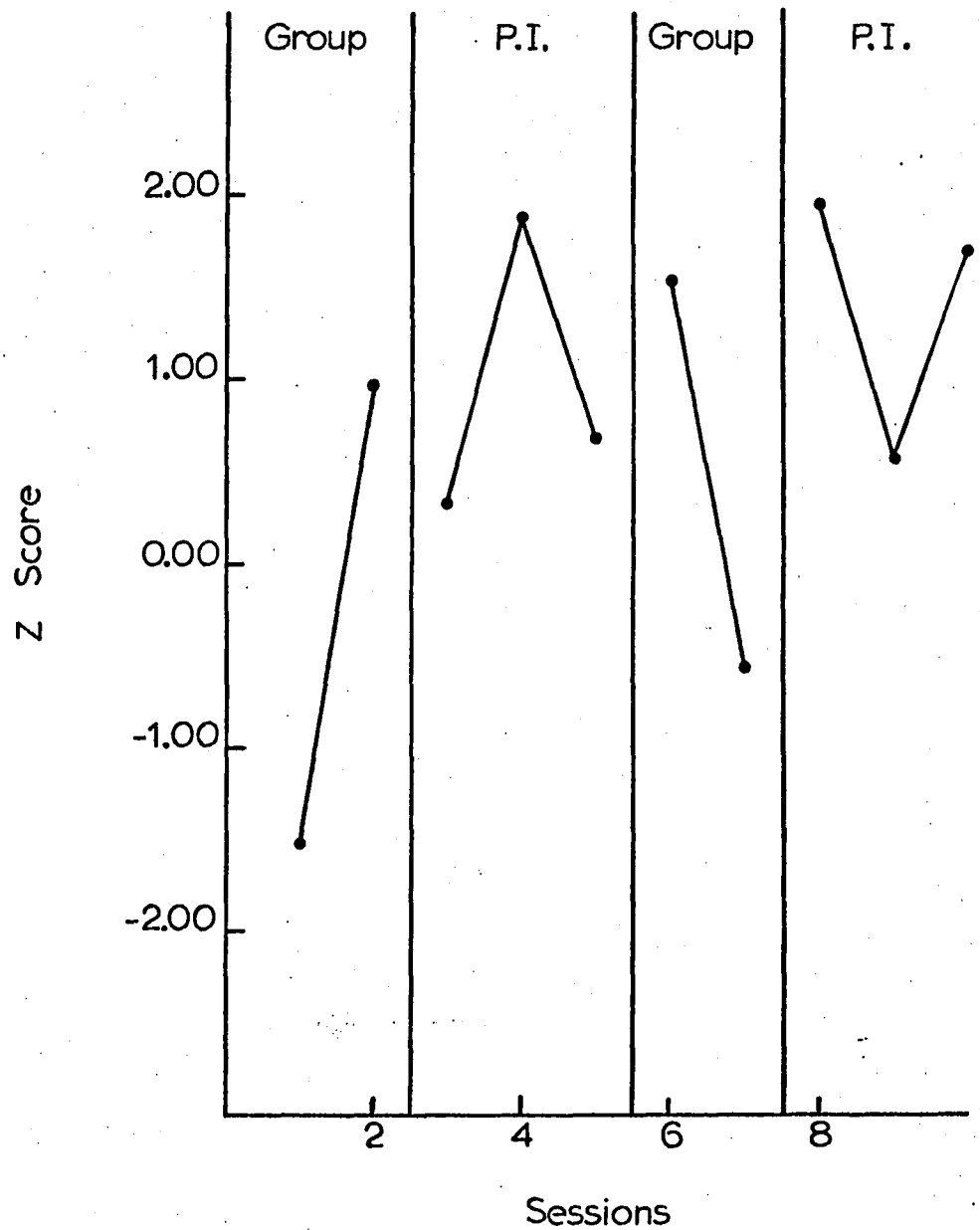

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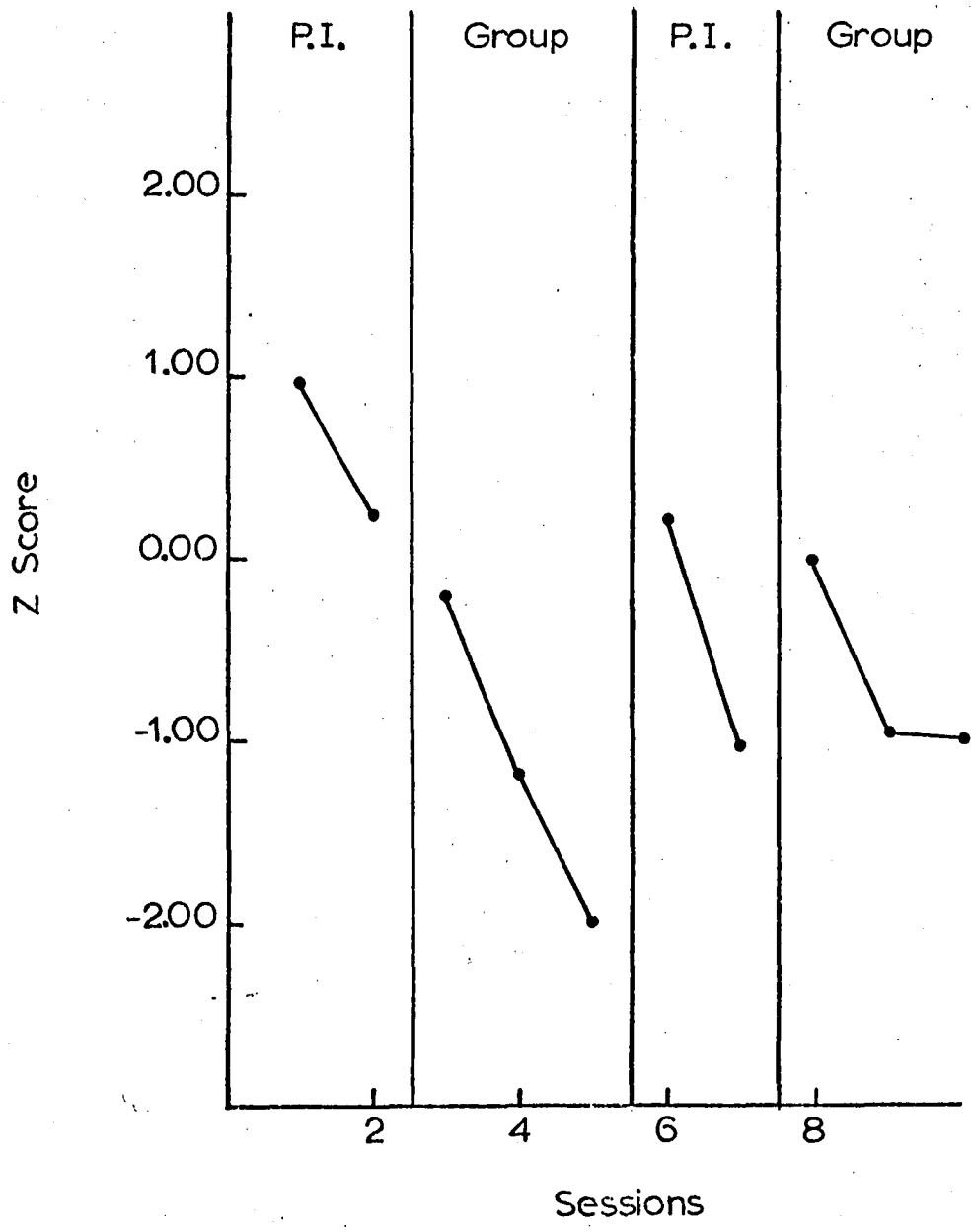

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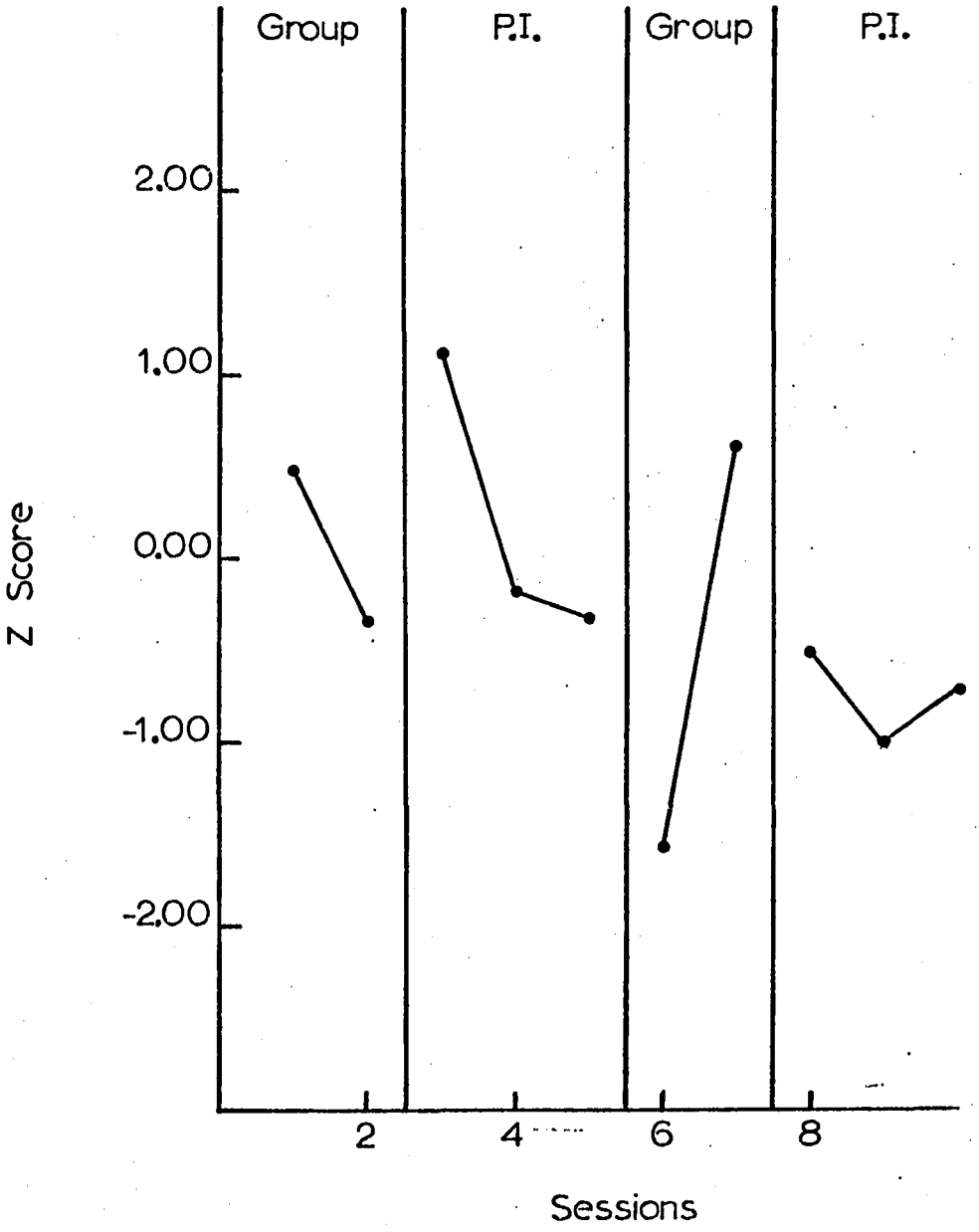

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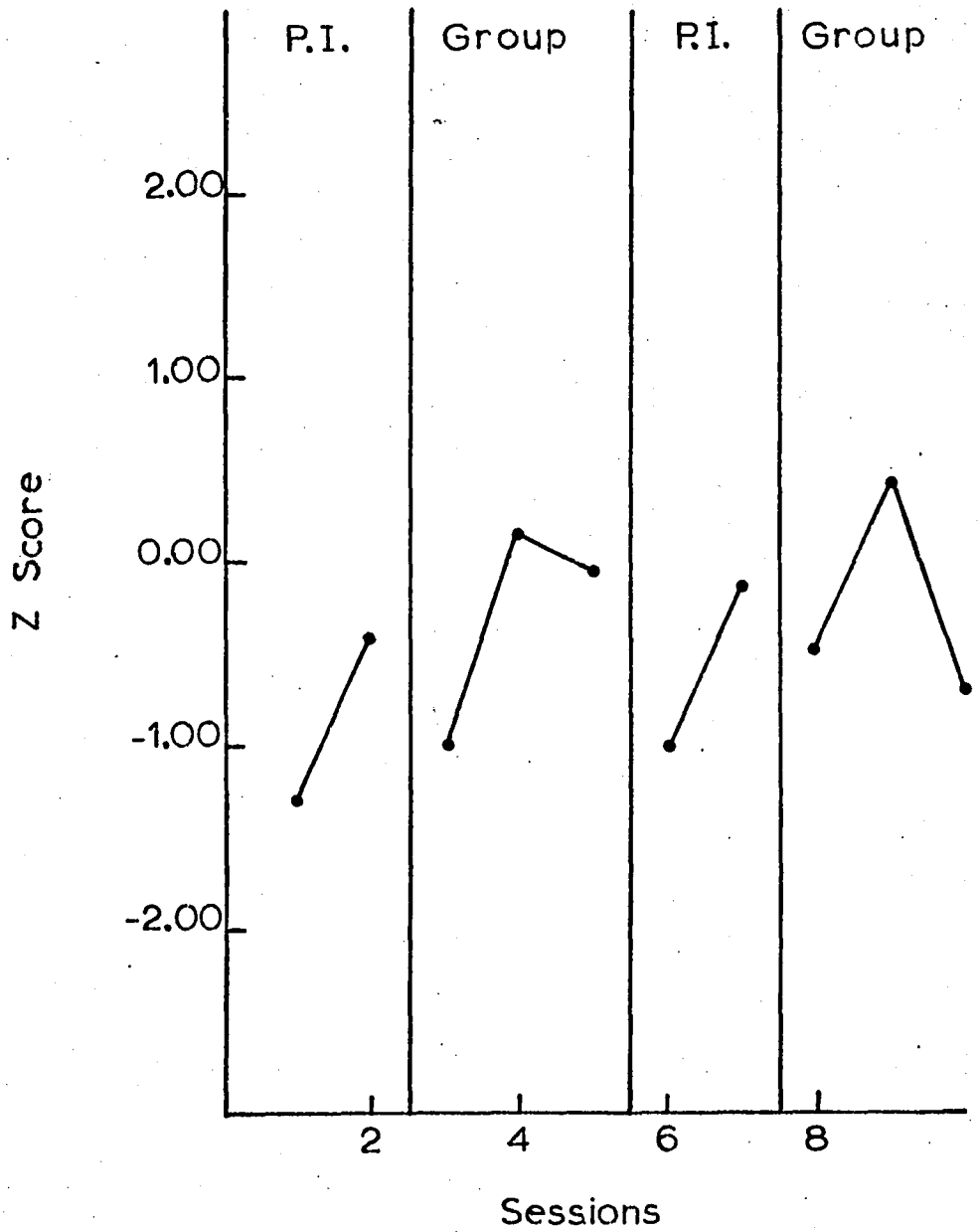

Fig. 28. Test performance for subject 28.

In Experiment II data were collected for two additional classroom behaviors, attending and responding. Figures 29 through 36 summarize the results of these data. In general there was no functional relationship observed between attending and the teaching method used. For responding, however, a functional relationship was apparent for six of the eight subjects observed. For all six subjects the frequency of responding was higher during the periods in which the performance interview was the method of instruction. Two subjects never responded at all during the observation periods.

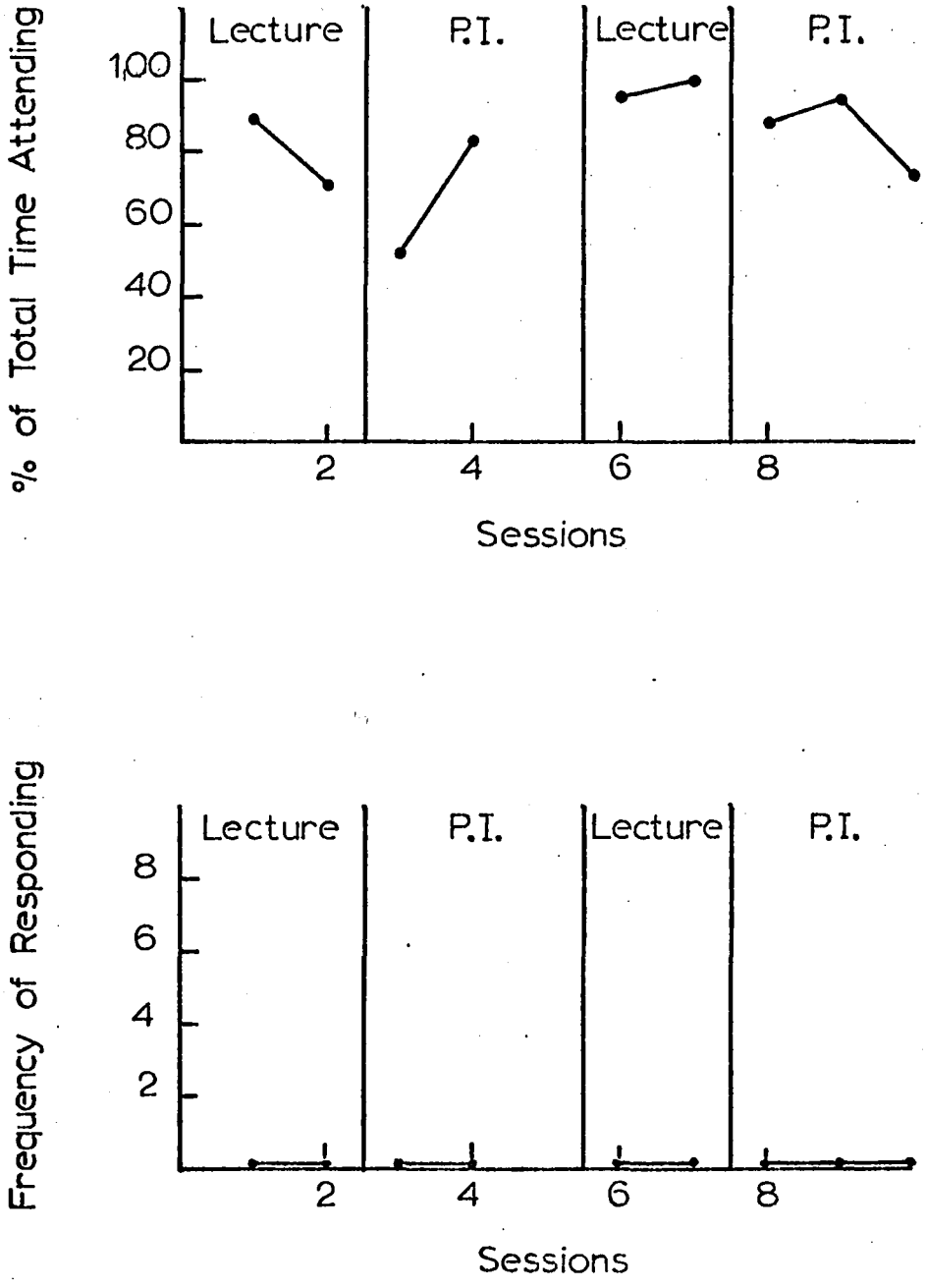

Fig. 29. Attending and responding for subject 3.

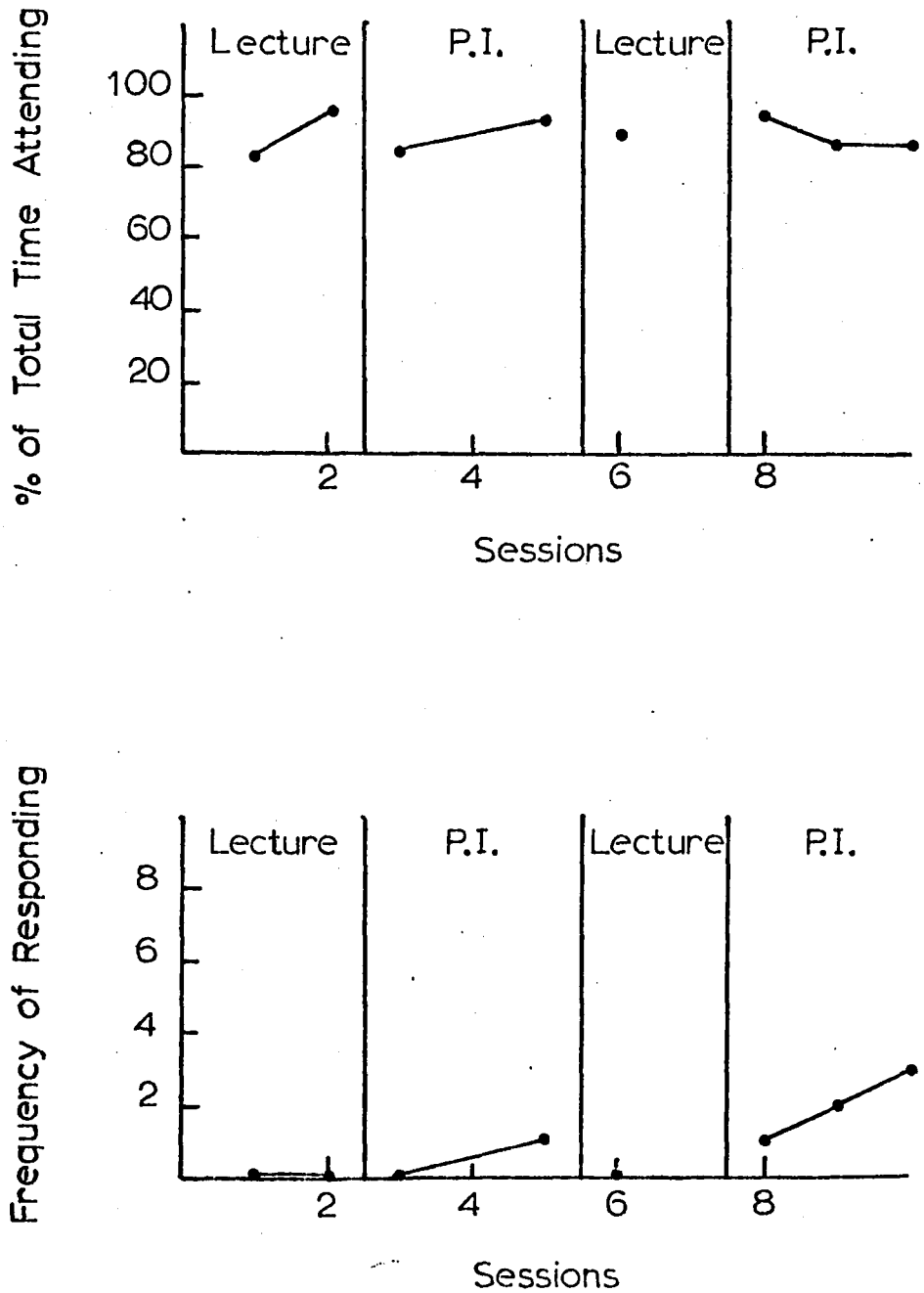

Fig. 30. Attending and responding for subject 5.

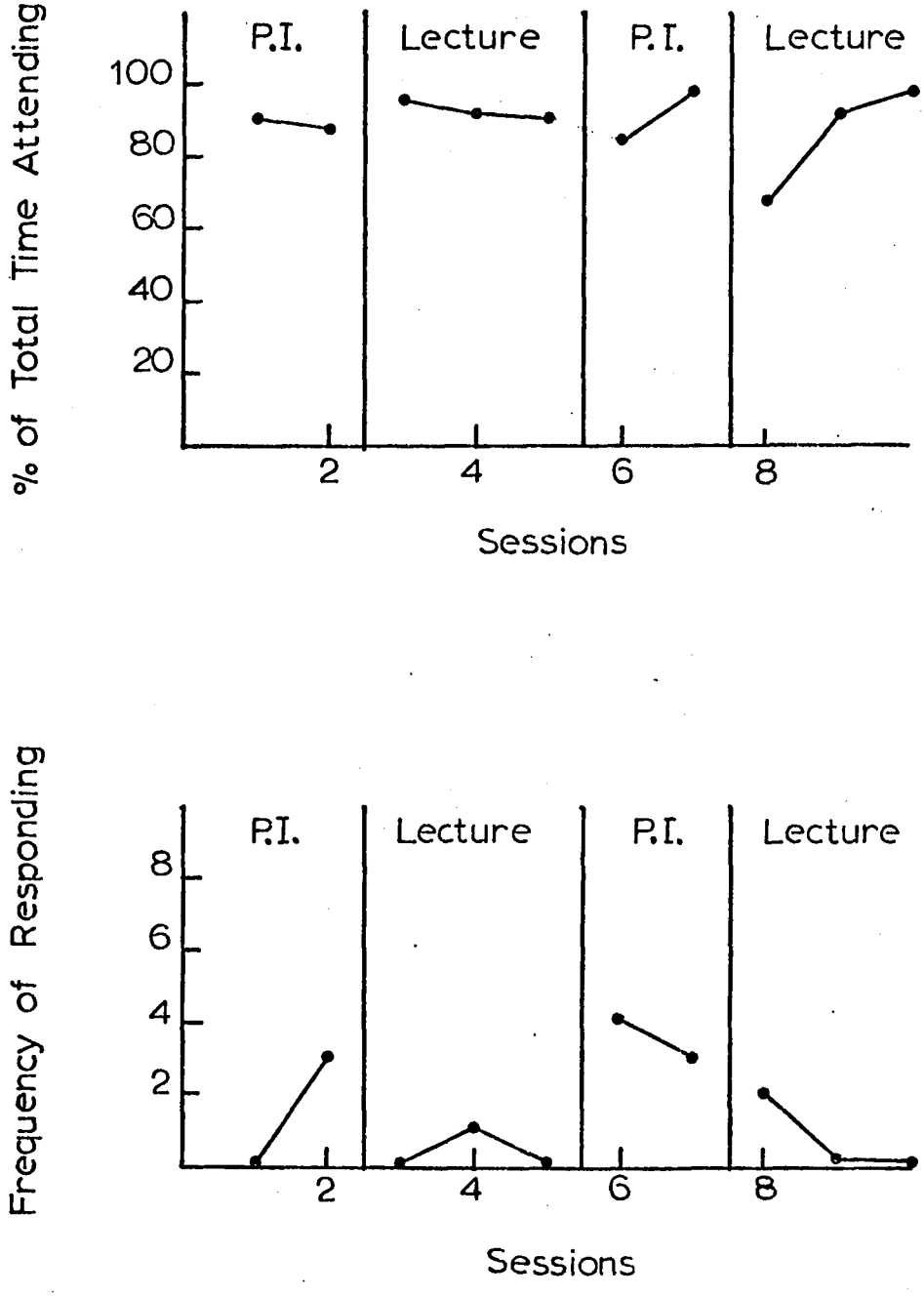

Fig. 31. Attending and responding for subject 8.

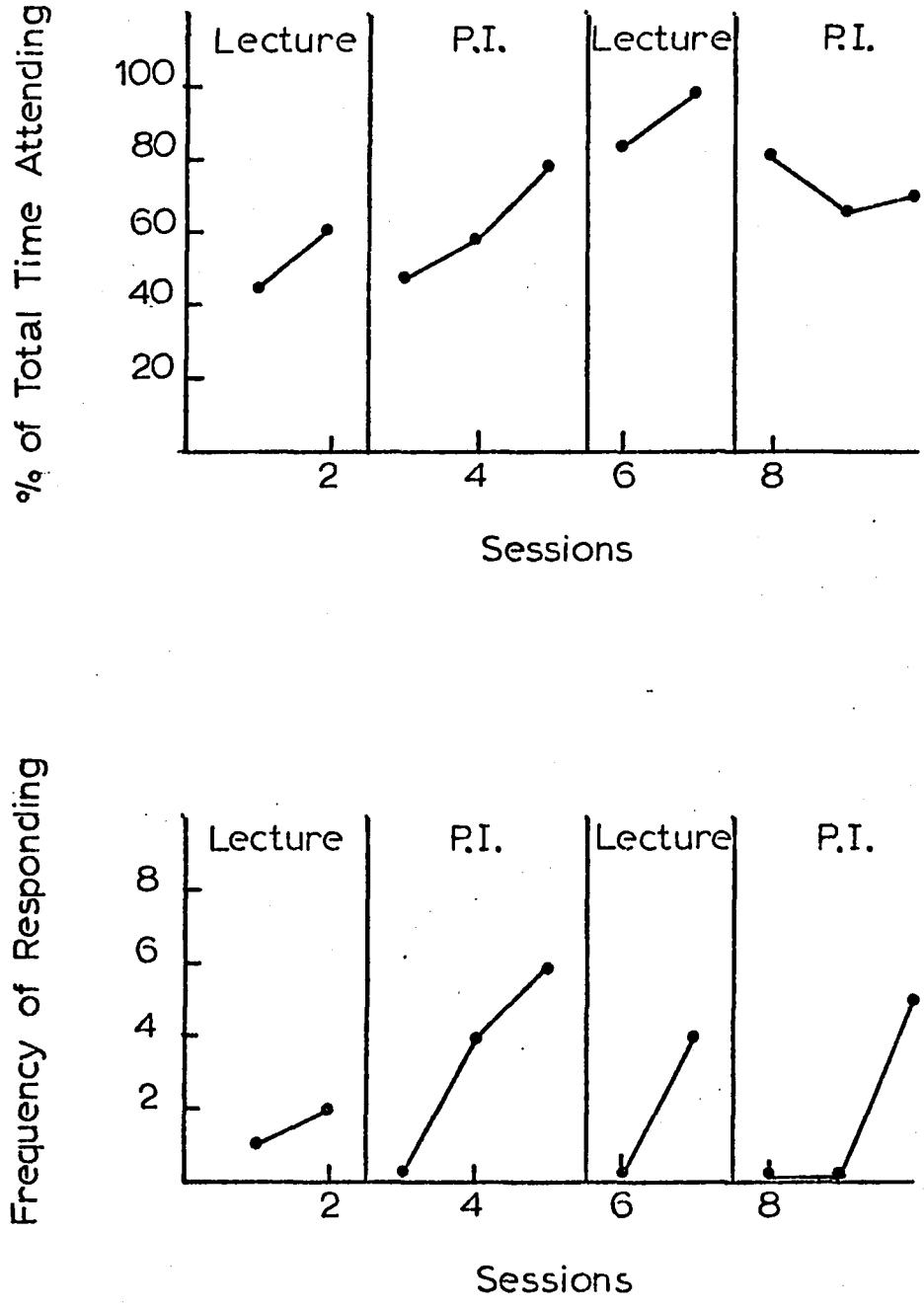

Fig. 32. Attending and responding for subject 9.

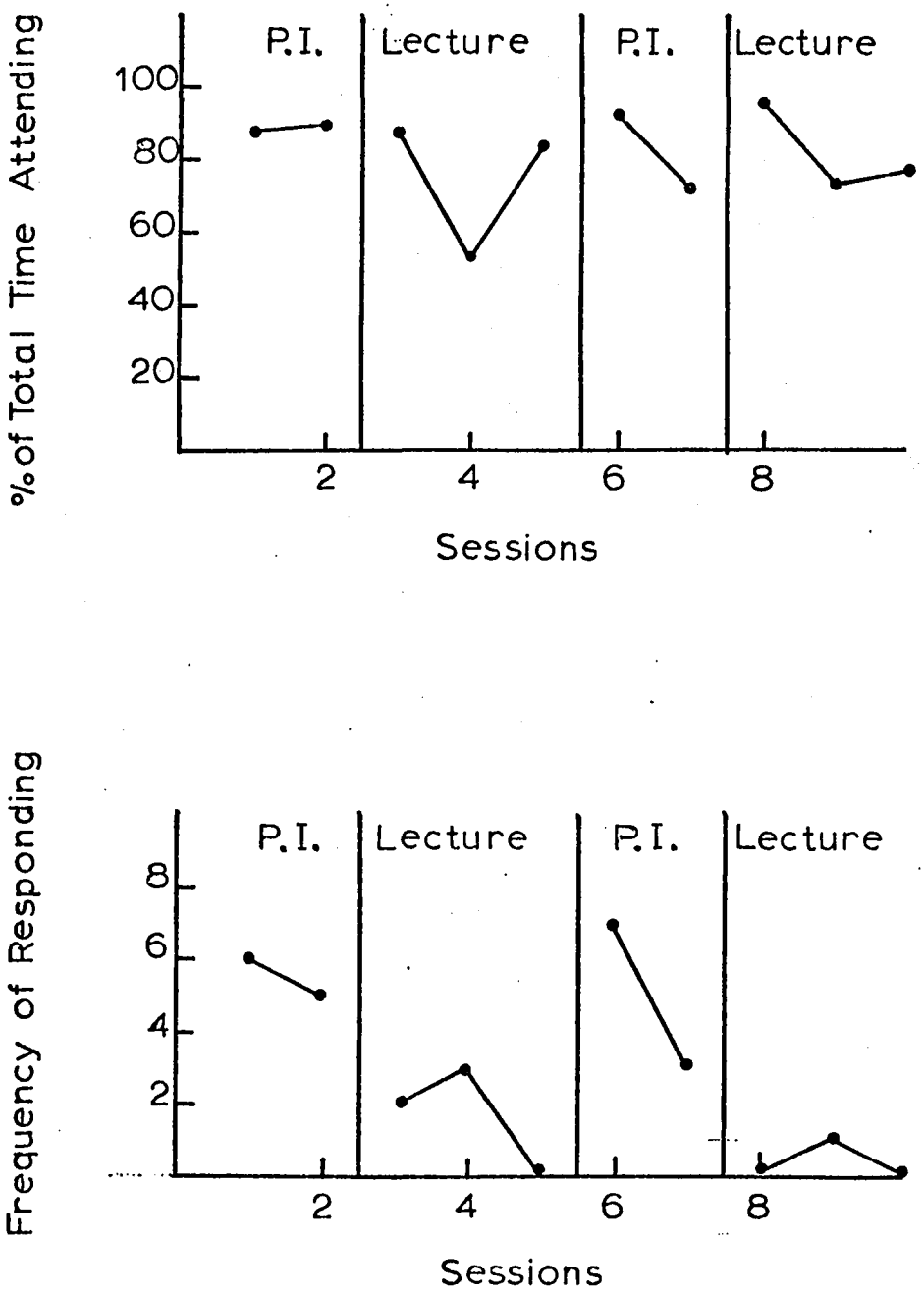

Fig. 33. Attending and responding for subject 10.

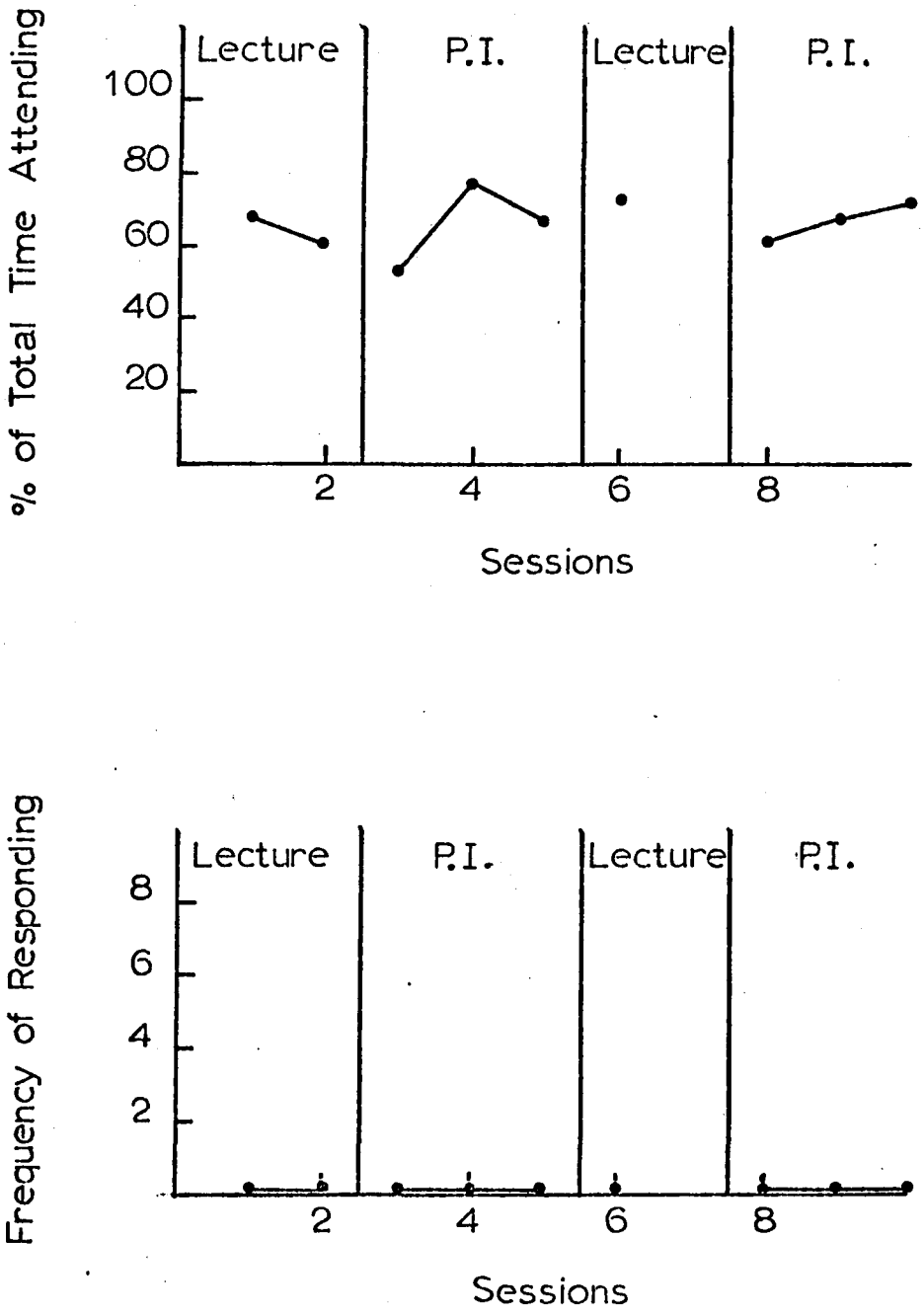

Fig. 34. Attending and responding for subject 11.

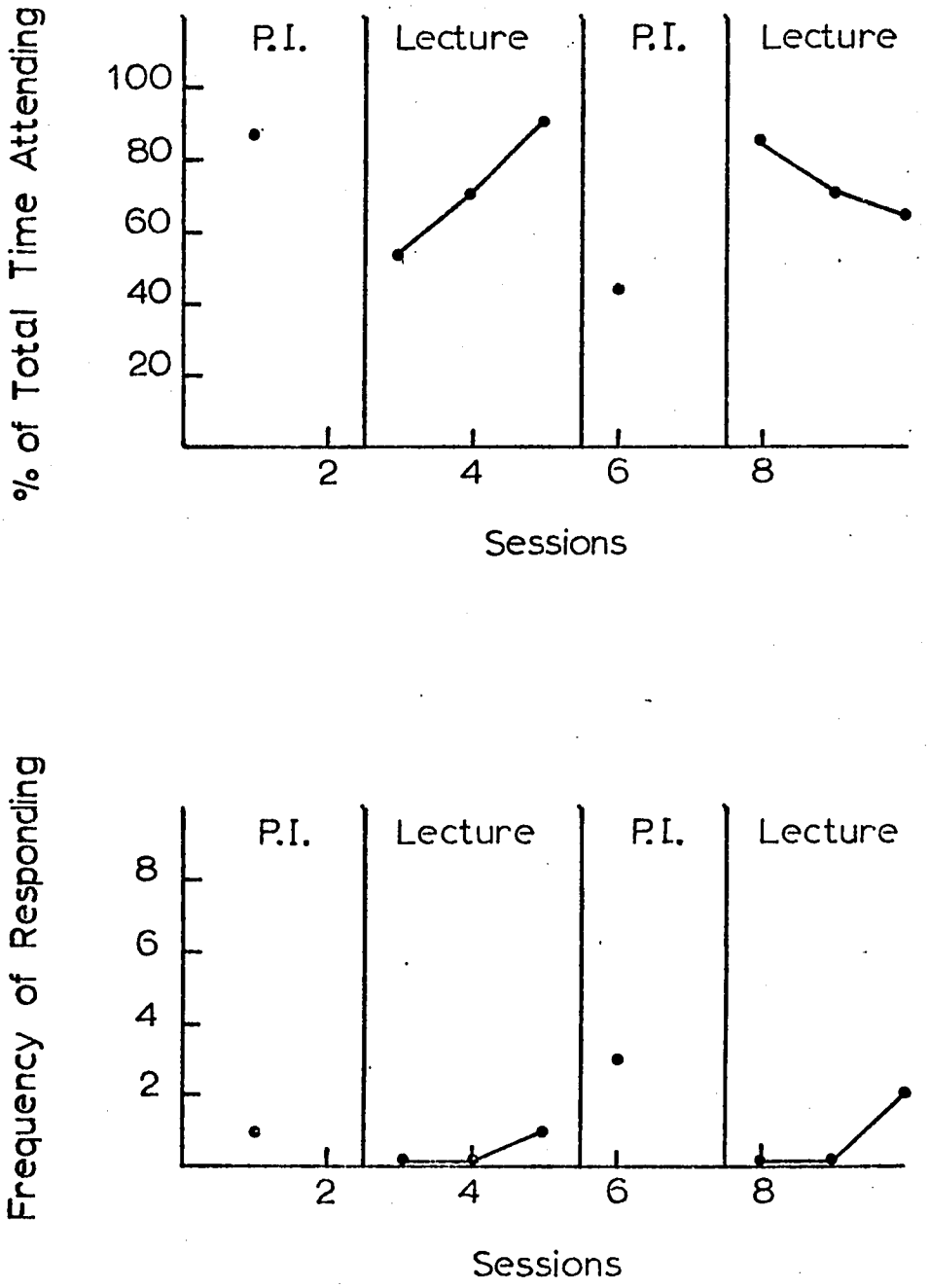

Fig. 35. Attending and responding for subject 18.

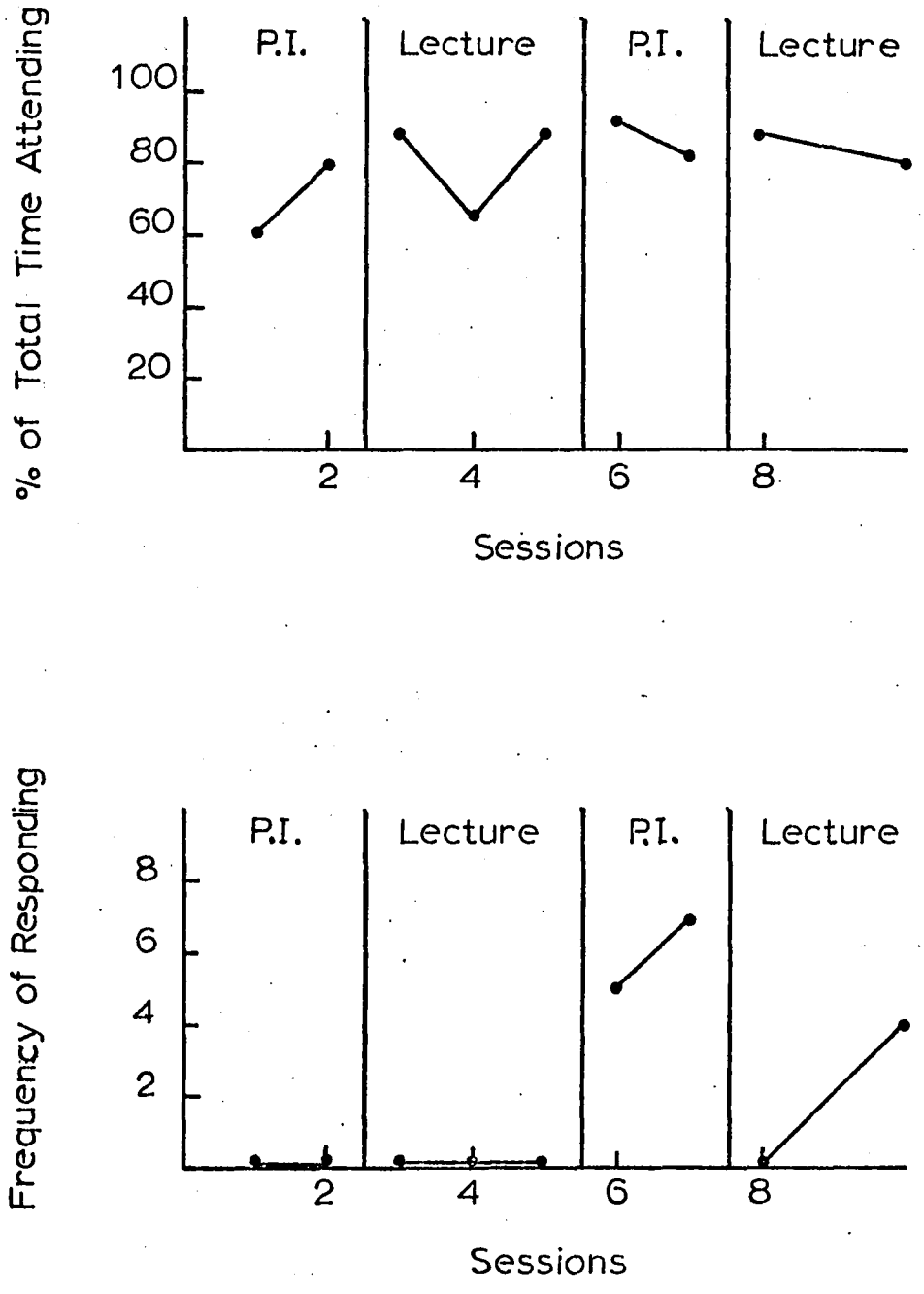

Fig. 36. Attending and responding for subject 20.

CHAPTER VI

DISCUSSION

The primary question asked in this study was: Is there a difference in student mastery of course content between periods in which the small group discussion or the lecture is the instructional method employed and periods in which the performance interview is employed. The answer to this question is a qualified "yes." The results of this investigation demonstrate that for the majority of subjects studied the performance interview was superior to the more traditional methods in producing mastery of course material.

In Experiment I, where the baseline condition was the small group discussion, the overall results were not significant. Null Hypothesis 1, which stated that there is no significant difference in the scores of students on weekly examinations between group discussion (baseline) and performance interview (experimental) conditions, could not be rejected. Individual data showed that for two of the seven subjects test performance was better during interview periods as compared with one subject for whom test performance was better during group discussion periods.

In Experiment II, where the baseline condition was the lecture, the results were significant ($p < .05$). Null Hypothesis 2, which stated that there is no significant difference in the scores of students on weekly examinations between lecture (baseline) and performance interview (experimental) conditions, was rejected. For 13 of the 21 subjects in this investigation test performance was superior during interview conditions as compared to one subject for whom test performance was higher during lecture periods.

In general the results of this study support previous investigations which have used a group design to demonstrate the efficacy of the interview as a successful teaching methodology (Ferster, 1968; Keller, 1968; Sheppard & MacDermot, 1970). However, the use of the time series single subject design in this study extends the substantiation of the interview technique by demonstrating a functional relationship between the interview and increased test performance for individual students.

This investigation further extends the study of the performance interview through the investigation of four subsidiary questions not considered in any previous research. The first of the subsidiary questions was: Is there a

difference in frequency of responding in class between lecture and performance interview conditions? For six of the eight subjects observed the answer was in the affirmative. For each of these six students frequency of responding in class was higher during performance interview conditions than during lecture conditions.

Since the use of the performance interview did affect responding in class for the majority of students observed, it seems reasonable to hypothesize that the increased frequency of responding was due to a generalization effect from the direct control and reinforcement of verbal behavior maintained by the interview procedure.

The second subsidiary question was: Is there a difference in attending in class between lecture and performance interview conditions? This question must be answered negatively. No trends were apparent for any subject. It would seem that factors other than teaching method account for classroom attending.

The third subsidiary question in this study involved the difference in test results of those who received the ABAB sequence of conditions and those who received the BABA sequence. The results show that the sequence of conditions

was a significant factor in student performance. For those students who began the course using the performance interview (i.e. the BABA sequence) performance was significantly higher under the performance interview conditions, regardless of whether the baseline method was small group discussion or lecture. For students who began the course with another method, no method was significantly superior. The reason for this result is not immediately apparent from this research. It might be hypothesized that subjects formulated an instructional "set" at the beginnning of the course which affected their subsequent expectations and performance in the course.

The fourth subsidiary question pertained to the effect of the sequence of conditions upon attending and responding. As already pointed out, no functional relationship between teaching method and attending was observed for any subjects. Of the six subjects for whom frequency of responding was higher during interview conditions, two received the ABAB sequence and four received the BABA sequence.

It became apparent during the course of this study that a limitation was the length of time devoted to each time segment. Inasmuch as a 10-week period was allotted

for the study, time segments consisted of two to three weeks each. As is shown by the graphs (Figures 1-36), operant levels were not stable within the time segments. The teaching method was switched three times for all subjects within the 10 weeks, and the performance interview was a new approach for all subjects; therefore, it is possible that the fixed time segments did not allow sufficient time for adjustment to the new method and a stabilization of behavior. The positive curves within experimental periods as compared to the positive curves within baseline conditions lead one to suspect that differences in performance might have been even more significant if the behavior had had sufficient time to stabilize.

A factor to be considered in the interpretation of the data in Experiment I was the number of subjects involved. With only seven subjects, the erratic performance of even one subject could have affected significantly the results of the *t* test. Nevertheless, the small number of subjects involved does not obscure the value of the functional analysis of the individual data.

Another limitation of this study was the failure to establish the validity and reliability of the tests used. No evaluation, other than simple face validity, of the

professor-constructed weekly examinations was made. This factor was controlled for within groups by using the same examination for all subjects. However, the failure to establish instrument validity and reliability does impose limitations upon the data with regard to comparisons across groups. It was not within the scope of this study to make inter-group comparisons nor to investigate tests as a satisfactory measure of mastery of information.

There are a number of uncontrolled variables which may have been operating within this investigation. The personal preferences and abilities of each teaching assistant for a particular teaching method as well as their individual behavioral repertoires were probably important factors. Specifically, the successful use of the performance interview is related to the ability of the interviewer to serve as an effective dispenser of reinforcers, just as the success of the lecture or any other method is related to certain instructor abilities.

A multiplicity of outside factors unrelated to the class may have affected classroom behavior of a subject. The individual behavioral repertoires, prior histories of reinforcement of verbal behavior, motivation, and the

influence of outside events are but a few of the factors which are likely to impinge upon an individual's classroom performance. Such factors were impossible to control within the limits of this investigation.

CHAPTER VIII

SUMMARY

In general the data of this investigation indicated that for the particular variables examined the performance interview was a more effective instructional methodology than either small group discussion or the lecture method. For the majority of subjects a change in instructional method brought a concomitant change in performance. The use of the performance interview was related to higher test performance and higher frequency of responding in class. Attending, however, did not appear to be related to instructional method.

A further conclusion which may be drawn from this investigation regards the nature of the sequence effect upon subject performance. For subjects who began the experiment with the interview technique rather than the lecture or group discussion (BABA sequence) the differences in performance in favor of the interview were greater than for those whose sequence began with a baseline condition (ABAB). One cannot make the generalization that

subjects do better with whatever method is established at the beginning of a course since this was not the case. However, it does seem reasonable to conclude that students may develop an instructional "set" which is one important factor influencing their performance in the course.

The implications of these findings for graduate instruction would appear relevant. The results of this study indicated that the performance interview was generally superior to the traditional approaches in achieving student mastery of course content. The interview, while certainly not a panacea for educational problems, does furnish an illustration of how psychological principles and behavioral analyses can be applied successfully to teaching.

Implications for further research would include investigation of the previously mentioned sequence effect. An exploration of the apparent instructional "set" could prove interesting as well as beneficial to the understanding of the learning process.

Subsequent research should include studies which are broader in scope to include variables not considered in this study. The relationship of teaching method to independent variables such as student opinion of the course or

student and instructor characteristics could shed important light on reasons for failures of our educational system as well as suggest courses for improvement.

The results of this study raise an interesting question regarding classroom attending. Since in this investigation no relationship was observed between attending and teaching method or test performance, one must question the assumption that attending is a desired classroom behavior. Perhaps the primary function of attending is to reinforce the speaker, which may or may not be beneficial for student learning.

In the future research with the performance interview must move in the direction of analysis of the components of the interview itself. It would be valuable to know whether the success of the interview technique is due to the programming of course content, the emphasis on verbal behavior, repetition, frequent social reinforcement from the interviewer, or to a combination of these or other components.

REFERENCES

Altman, K. I. & Linton, J. C. Operant conditioning in the classroom setting: A review of the research. Journal of Educational Research, 1971, 64, 277-286.

Baer, D. M. Reinforcement grows up: The experimental analysis of behavior as a systematic approach to the teaching of developmental psychology. Paper presented at the annual meeting of the American Psychological Association, New York, 1966.

Baer, D. M., Wolf, M. M., & Risley, T. R. Some current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 1968, 1, 91-97.

Bijou, S. W., Peterson, R. F., Harris, F. R., Allen, K. E., Johnston, M. S. Methodology for experimental studies of young children in natural settings. Psychological Record, 1969, 19, 177-210.

Calvin, A. D. (ed.) Programmed instruction: Bold new venture. Bloomington, Indiana, University Press, 1969.

Chahbazi, P. Use of reinforcement in education. Journal of Educational Research, 1967, 61, 126.

Doty, B. A. & Doty, Z. A. Teaching method effectiveness in relation to certain student characteristics. Journal of Educational Research, 1967, 60, 363-365.

Dubin, R. & Taveggia, T. C. The teaching-learning paradox: A comparative analysis of college teaching methods. Eugene, Oregon: CASEA, 1969.

Eckert, R. E. & Neale, D. C. Teachers and teaching; college teaching. Review of Educational Research, 1965, 35, 307-313

Ferster, C. B. Individualized instruction in a large introductory psychology course. Psychological Record, 1968, 18, 521-532.

Ferster, C. B. & Perrott, M. C. Behavior principles. New York: Meridith Corporation, 1968.

Fiebert, M. S. The college classroom: Models of education - techniques for change. Psychological Reports, 1970, 26, 819-827.

Fischler, A. S. The role of the professor and technology in higher education. Educational Technology, 1970, 10, 21-23.

Flynn, J. T. The influence of programmed instruction upon learning in educational psychology. Journal of Educational Research, 1966, 59, 387-91.

Gage, N. L. An analytical approach to research on instructional method. ERIC Report No. BR - 5 - 0252-2, 1966

Gage, N. L. & Unruh, W. R. Theoretical formulations for research on teaching. Review of Educational Research, 1967, 37, 358-370.

Gilbert, J. E. Programmed learning and university instructional services. in Calvin, A. D. (ed.) Programmed instruction: Bold new venture, Bloomington, Indiana: University Press, 1969.

Glaser, R. (ed.) Teaching machines and programmed learning Washington, D. C.: National Education Association, 1965.

Gruber, H. E. An approach to independent study. Report 13 in New dimensions in higher education. Washington, D.C.: U. S. Office of Education, 1965.

Hanley, E. M. Review of research involving applied behavior in the classroom. Review of Educational Research, 1970, 40, 597-625.

Hobbs, J. N. Discussion in the college classroom. Journal of General Education, 1970, 21, 249-258.

Ikenberry, S. O. Specifications for change in collegiate instruction. Educational Record, 1971, 52, 77-80

Keller, F. S. A personal course in psychology. in Ulrich, R., Stachnik, T., & Mabry, J. Control of human behavior. Glenview, Illinois: Scott Foresman, 1966.

Keller, F. A. Good-bye, teacher. Journal of Applied Behavior Analysis, 1968, 1, 79-89.

Lloyd, K. E. & Knutzen, N. J. A self-paced programmed undergraduate course in the experimental analysis of behavior. Journal of Applied Behavior Analysis, 1969, 2, 125-133.

Lumsdaine, A. A. & Glaser R. (ed.) Teaching machines and programmed learning: A scource book. Washington, D. C.: National Education Association, 1960.

Malott, R. W. & Rollofson, R. L. An empirical evaluation of student-led discussions. (Based upon a thesis submitted by the junior author) mimeo, 1970.

Malott, R. W. & Svinicki, J. G. Contingency management in an introductory psychology course for 1000 students. Psychological Record, 1969, 19, 545-556.

Martin, R. F. Toward a conceptualization of learning processes in the college classroom I: A review of operant research. ERIC Report No. ED046044, 1970.

McGrew, J. M., Marcia, J. E., & Wright, C. K. Branching program text, and lecture: A comparative investigation of instructional media. Journal of Applied Psychology, 1966, 50, 505-508

McKeachie, W. J. Research on teaching at the college level. in Gage, N. L. (ed.) Handbook of research on teaching. Chicago: Rand McNally, 1962.

McMichael, J. A. & Corey, J. R. Contingency management in an introductory psychology course produces better learning. Journal of Applied Behavior Analysis, 1969, 2, 79-83.

Myers, W. A. Operant learning principles applied to teaching introductory statistics. Journal of Applied Behavior Analysis, 1970, 3, 191-197.

Packard, R. G. The control of classroom attention: A group contingency for complex behavior. Journal of Applied Behavior Analysis, 1970, 3, 13-28.

Pitts, C. E. & Powers, M.A. A study of undergraduate performance in an incentive course in educational psychology. in Pitts, C. E. (ed.) Operant conditioning in the classroom, New York: Thomas Y. Crowell, 1971.

Rawls, J. R., Perry, O., & Timmons, E. O. A comparative study of conventional instruction and individual programmed instruction in the college classroom. Journal of Applied Psychology, 50, 1966, 388-391.

Ryan, T. A. Testing instructional approaches for increased learning. Phi Delta Kappan, 1965, 46, 534-536.

Sheppard, W. C. & MacDermot, H. G. Design and evaluation of a programmed course in introductory psychology. Journal of Applied Behavior Analysis, 1970, 3, 5-11.

Sidman, M. Tactics in scientific research. New York: Basic Books, 1960.

Skinner, B. F. Reflections on a decade of teaching machines. in Glaser, R. (ed.) Teaching machines and programmed learning: II Data and directions, Washington, D. C.: National Education Association, 1965, 5-20.

Skinner, B. F. The technology of teaching. New York: Appleton-Century-Crofts, 1968.

Skinner, B. F. Verbal behavior. New York: Appleton-Century-Crofts, 1957.

Staats, A. W. Learning, language, and cognition. New York: Holt, Rinehart, & Winston, 1968.

Webb, C. & Baird, J. H. Learning differences resulting from teacher- and student-centered teaching methods. Paper presented at AERA Annual meeting. New York, 1967.

Worf, B. L. Science and linguistics. in Carroll, J. B. (ed.). Language, thought, and reality. Cambridge, Massachusetts.

Williams, E. M. Innovations in undergraduate teaching. Science, 1967, 155, 974-979.

APPENDIX A

Instructions for Observers

Observation will be done in 10 second intervals for periods of 10 minutes. Each observer will observe and record for 3 periods each night.

The counting off of intervals has been tape recorded so that each observer will receive the count through individual headsets. Observers will work in pairs, with each member of the pair recording the same behavior during the same time period, so that continuous estimates of observer reliability may be made.

The following variables will be observed:

1. Responding behavior - the number of verbal responses made by a subject to the class. (Length of responses is to be disregarded as is a response made only to the person beside subject - i.e. not to the class as a whole.) Simply count the number of responses and record on the Observer Data Sheet.

2. Attending behavior - Attending behavior will be defined by the following categories:

   N - Notetaking - pencil moving on paper

   O - Orientation of head and eyes toward speaker

   V - Verbalization (same as variable 1 - responding behavior) directed toward group as a whole.

Any time these behaviors are emitted by the subject during a 10 second interval the observer will record the appropriate code letter in that interval block on the Observer Data Sheet. More than one code letter may be recorded in a single block if necessary. If the subject does not emit any of the attending behaviors during the interval the observer will record an X.

3. Class participation - this variable will be defined as the percentage of time that students are talking. Observers will record behavior using the following code:

T - teacher speaking, questioning, writing on board

S - any student speaking to the class

Q - quiet, (neither S nor T has occurred in the interval)

APPENDIX B

OBSERVER DATA SHEET

OBSERVER_____ TIME_____ DATE_____

SUBJECT_____

10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60
10	20	30	40	50	60